Configuring Dial Services

BayRS Version 12.00
Site Manager Software Version 6.00

Part No. 117353-A Rev. A
September 1997

Bay Networks

Bay Networks

4401 Great America Parkway
Santa Clara, CA 95054

8 Federal Street
Billerica, MA 01821

Copyright © 1997 Bay Networks, Inc.

All rights reserved. Printed in the USA. September 1997.

The information in this document is subject to change without notice. The statements, configurations, technical data, and recommendations in this document are believed to be accurate and reliable, but are presented without express or implied warranty. Users must take full responsibility for their applications of any products specified in this document. The information in this document is proprietary to Bay Networks, Inc.

The software described in this document is furnished under a license agreement and may only be used in accordance with the terms of that license. A summary of the Software License is included in this document.

Trademarks

ACE, AFN, AN, BCN, BLN, BN, BNX, CN, FN, FRE, GAME, LN, and Bay Networks are registered trademarks and Advanced Remote Node, ANH, ARN, ASN, Bay•SIS, BayStack, EZ Install, Switch Node, System 5000, Bay Networks Press, and the Bay Networks logo are trademarks of Bay Networks, Inc.

Microsoft, MS, MS-DOS, Win32, Windows, and Windows NT are registered trademarks of Microsoft Corporation.

All other trademarks and registered trademarks are the property of their respective owners.

Restricted Rights Legend

Use, duplication, or disclosure by the United States Government is subject to restrictions as set forth in subparagraph (c)(1)(ii) of the Rights in Technical Data and Computer Software clause at DFARS 252.227-7013.

Notwithstanding any other license agreement that may pertain to, or accompany the delivery of, this computer software, the rights of the United States Government regarding its use, reproduction, and disclosure are as set forth in the Commercial Computer Software-Restricted Rights clause at FAR 52.227-19.

Statement of Conditions

In the interest of improving internal design, operational function, and/or reliability, Bay Networks, Inc. reserves the right to make changes to the products described in this document without notice.

Bay Networks, Inc. does not assume any liability that may occur due to the use or application of the product(s) or circuit layout(s) described herein.

Portions of the code in this software product are Copyright © 1988, Regents of the University of California. All rights reserved. Redistribution and use in source and binary forms of such portions are permitted, provided that the above copyright notice and this paragraph are duplicated in all such forms and that any documentation, advertising materials, and other materials related to such distribution and use acknowledge that such portions of the software were developed by the University of California, Berkeley. The name of the University may not be used to endorse or promote products derived from such portions of the software without specific prior written permission.

SUCH PORTIONS OF THE SOFTWARE ARE PROVIDED “AS IS” AND WITHOUT ANY EXPRESS OR IMPLIED WARRANTIES, INCLUDING, WITHOUT LIMITATION, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

In addition, the program and information contained herein are licensed only pursuant to a license agreement that contains restrictions on use and disclosure (that may incorporate by reference certain limitations and notices imposed by third parties).

Bay Networks, Inc. Software License Agreement

NOTICE: Please carefully read this license agreement before copying or using the accompanying software or installing the hardware unit with pre-enabled software (each of which is referred to as "Software" in this Agreement). BY COPYING OR USING THE SOFTWARE, YOU ACCEPT ALL OF THE TERMS AND CONDITIONS OF THIS LICENSE AGREEMENT. THE TERMS EXPRESSED IN THIS AGREEMENT ARE THE ONLY TERMS UNDER WHICH BAY NETWORKS WILL PERMIT YOU TO USE THE SOFTWARE. If you do not accept these terms and conditions, return the product, unused and in the original shipping container, within 30 days of purchase to obtain a credit for the full purchase price

1. License Grant. Bay Networks, Inc. ("Bay Networks") grants the end user of the Software ("Licensee") a personal, nonexclusive, nontransferable license: a) to use the Software either on a single computer or, if applicable, on a single authorized device identified by host ID, for which it was originally acquired; b) to copy the Software solely for backup purposes in support of authorized use of the Software; and c) to use and copy the associated user manual solely in support of authorized use of the Software by Licensee. This license applies to the Software only and does not extend to Bay Networks Agent software or other Bay Networks software products. Bay Networks Agent software or other Bay Networks software products are licensed for use under the terms of the applicable Bay Networks, Inc. Software License Agreement that accompanies such software and upon payment by the end user of the applicable license fees for such software.

2. Restrictions on use; reservation of rights. The Software and user manuals are protected under copyright laws. Bay Networks and/or its licensors retain all title and ownership in both the Software and user manuals, including any revisions made by Bay Networks or its licensors. The copyright notice must be reproduced and included with any copy of any portion of the Software or user manuals. Licensee may not modify, translate, decompile, disassemble, use for any competitive analysis, reverse engineer, distribute, or create derivative works from the Software or user manuals or any copy, in whole or in part. Except as expressly provided in this Agreement, Licensee may not copy or transfer the Software or user manuals, in whole or in part. The Software and user manuals embody Bay Networks' and its licensors' confidential and proprietary intellectual property. Licensee shall not sublicense, assign, or otherwise disclose to any third party the Software, or any information about the operation, design, performance, or implementation of the Software and user manuals that is confidential to Bay Networks and its licensors; however, Licensee may grant permission to its consultants, subcontractors, and agents to use the Software at Licensee's facility, provided they have agreed to use the Software only in accordance with the terms of this license.

3. Limited warranty. Bay Networks warrants each item of Software, as delivered by Bay Networks and properly installed and operated on Bay Networks hardware or other equipment it is originally licensed for, to function substantially as described in its accompanying user manual during its warranty period, which begins on the date Software is first shipped to Licensee. If any item of Software fails to so function during its warranty period, as the sole remedy Bay Networks will at its discretion provide a suitable fix, patch, or workaround for the problem that may be included in a future Software release. Bay Networks further warrants to Licensee that the media on which the Software is provided will be free from defects in materials and workmanship under normal use for a period of 90 days from the date Software is first shipped to Licensee. Bay Networks will replace defective media at no charge if it is returned to Bay Networks during the warranty period along with proof of the date of shipment. This warranty does not apply if the media has been damaged as a result of accident, misuse, or abuse. The Licensee assumes all responsibility for selection of the Software to achieve Licensee's intended results and for the installation, use, and results obtained from the Software. Bay Networks does not warrant a) that the functions contained in the software will meet the Licensee's requirements, b) that the Software will operate in the hardware or software combinations that the Licensee may select, c) that the operation of the Software will be uninterrupted or error free, or d) that all defects in the operation of the Software will be corrected. Bay Networks is not obligated to remedy any Software defect that cannot be reproduced with the latest Software release. These warranties do not apply to the Software if it has been (i) altered, except by Bay Networks or in accordance with its instructions; (ii) used in conjunction with another vendor's product, resulting in the defect; or (iii) damaged by improper environment, abuse, misuse, accident, or negligence. THE FOREGOING WARRANTIES AND LIMITATIONS ARE EXCLUSIVE REMEDIES AND ARE IN LIEU OF ALL OTHER WARRANTIES EXPRESS OR IMPLIED, INCLUDING WITHOUT LIMITATION ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. Licensee is responsible for the security of

its own data and information and for maintaining adequate procedures apart from the Software to reconstruct lost or altered files, data, or programs.

4. Limitation of liability. IN NO EVENT WILL BAY NETWORKS OR ITS LICENSORS BE LIABLE FOR ANY COST OF SUBSTITUTE PROCUREMENT; SPECIAL, INDIRECT, INCIDENTAL, OR CONSEQUENTIAL DAMAGES; OR ANY DAMAGES RESULTING FROM INACCURATE OR LOST DATA OR LOSS OF USE OR PROFITS ARISING OUT OF OR IN CONNECTION WITH THE PERFORMANCE OF THE SOFTWARE, EVEN IF BAY NETWORKS HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES. IN NO EVENT SHALL THE LIABILITY OF BAY NETWORKS RELATING TO THE SOFTWARE OR THIS AGREEMENT EXCEED THE PRICE PAID TO BAY NETWORKS FOR THE SOFTWARE LICENSE.

5. Government Licensees. This provision applies to all Software and documentation acquired directly or indirectly by or on behalf of the United States Government. The Software and documentation are commercial products, licensed on the open market at market prices, and were developed entirely at private expense and without the use of any U.S. Government funds. The license to the U.S. Government is granted only with restricted rights, and use, duplication, or disclosure by the U.S. Government is subject to the restrictions set forth in subparagraph (c)(1) of the Commercial Computer Software—Restricted Rights clause of FAR 52.227-19 and the limitations set out in this license for civilian agencies, and subparagraph (c)(1)(ii) of the Rights in Technical Data and Computer Software clause of DFARS 252.227-7013, for agencies of the Department of Defense or their successors, whichever is applicable.

6. Use of Software in the European Community. This provision applies to all Software acquired for use within the European Community. If Licensee uses the Software within a country in the European Community, the Software Directive enacted by the Council of European Communities Directive dated 14 May, 1991, will apply to the examination of the Software to facilitate interoperability. Licensee agrees to notify Bay Networks of any such intended examination of the Software and may procure support and assistance from Bay Networks.

7. Term and termination. This license is effective until terminated; however, all of the restrictions with respect to Bay Networks' copyright in the Software and user manuals will cease being effective at the date of expiration of the Bay Networks copyright; those restrictions relating to use and disclosure of Bay Networks' confidential information shall continue in effect. Licensee may terminate this license at any time. The license will automatically terminate if Licensee fails to comply with any of the terms and conditions of the license. Upon termination for any reason, Licensee will immediately destroy or return to Bay Networks the Software, user manuals, and all copies. Bay Networks is not liable to Licensee for damages in any form solely by reason of the termination of this license.

8. Export and Re-export. Licensee agrees not to export, directly or indirectly, the Software or related technical data or information without first obtaining any required export licenses or other governmental approvals. Without limiting the foregoing, Licensee, on behalf of itself and its subsidiaries and affiliates, agrees that it will not, without first obtaining all export licenses and approvals required by the U.S. Government: (i) export, re-export, transfer, or divert any such Software or technical data, or any direct product thereof, to any country to which such exports or re-exports are restricted or embargoed under United States export control laws and regulations, or to any national or resident of such restricted or embargoed countries; or (ii) provide the Software or related technical data or information to any military end user or for any military end use, including the design, development, or production of any chemical, nuclear, or biological weapons.

9. General. If any provision of this Agreement is held to be invalid or unenforceable by a court of competent jurisdiction, the remainder of the provisions of this Agreement shall remain in full force and effect. This Agreement will be governed by the laws of the state of California.

Should you have any questions concerning this Agreement, contact Bay Networks, Inc., 4401 Great America Parkway, P.O. Box 58185, Santa Clara, California 95054-8185.

LICENSEE ACKNOWLEDGES THAT LICENSEE HAS READ THIS AGREEMENT, UNDERSTANDS IT, AND AGREES TO BE BOUND BY ITS TERMS AND CONDITIONS. LICENSEE FURTHER AGREES THAT THIS AGREEMENT IS THE ENTIRE AND EXCLUSIVE AGREEMENT BETWEEN BAY NETWORKS AND LICENSEE, WHICH SUPERSEDES ALL PRIOR ORAL AND WRITTEN AGREEMENTS AND COMMUNICATIONS BETWEEN THE PARTIES PERTAINING TO THE SUBJECT MATTER OF THIS AGREEMENT. NO DIFFERENT OR ADDITIONAL TERMS WILL BE ENFORCEABLE AGAINST BAY NETWORKS UNLESS BAY NETWORKS GIVES ITS EXPRESS WRITTEN CONSENT, INCLUDING AN EXPRESS WAIVER OF THE TERMS OF THIS AGREEMENT.

Contents

About This Guide

Before You Begin xxvi
Conventions xxvi
Acronyms xxvii
Ordering Bay Networks Publications xxviii
Bay Networks Customer Service xxix
How to Get Help xxix

Chapter 1
Getting Started

How to Use This Manual 1-1
Before You Begin 1-2
Setting Up a Dial Service 1-3
Configuring Line Pools 1-5
Creating Line Pools with Modem Lines 1-5
Creating Line Pools with ISDN Lines 1-11
Configuring BRI Lines 1-11
Configuring PRI Lines 1-12
Adding ISDN Lines to a Pool 1-16
Configuring Circuits 1-19
Creating Demand Circuits 1-19
Specifying the Authentication Protocol Information 1-22
Specifying the Connection Mode 1-22
Enabling a Protocol 1-23
Creating Backup Circuits 1-25
Specifying the Backup Mode 1-27
Specifying the Authentication Protocol Information 1-27
Creating Bandwidth Circuits 1-28
Configuring Leased Circuits as Bandwidth Circuits 1-28

Specifying the Bandwidth Mode 1-30
Specifying the Authentication Protocol 1-32
Adding Bandwidth Service for Demand Lines 1-33
Creating an Outgoing Phone List 1-36
Creating the Local Phone List (ISDN only) 1-38
Setting Up the Caller Resolution Table 1-40
What to Do Next 1-43

Chapter 2
Dial Services Overview

Bay Networks Dial Services 2-1
Network Access Methods and Services 2-3
Dial-on-Demand Service 2-4
Demand Lines and Pools 2-5
How Demand Lines, Pools, and Circuits Work Together 2-6
Demand Circuit Protocols 2-7
Configuring Frame Relay to Work Optimally with Dial-on-Demand 2-8
Activating Demand Circuits 2-9
Terminating Demand Circuits 2-10
Bandwidth-on-Demand Service for Congested Demand Lines 2-11
Dial Backup Service 2-13
Circuit Backup versus Link Backup 2-14
Knowing When the Primary Line Fails 2-16
Backup Lines and Pools 2-17
How Backup Lines, Pools, and Circuits Work Together 2-18
Configuration of the Backup Circuit 2-19
Activating the Backup Line 2-19
Reestablishing the Backup Connection 2-20
Terminating the Backup Connection 2-20
Bandwidth-on-Demand Service 2-21
Enabling Bandwidth-on-Demand Service 2-21
Bandwidth-on-Demand Lines and Pools 2-23
How Lines, Pools, and Circuits Work Together 2-24
Activating Dial-up Lines to Relieve Congestion 2-24
Terminating Secondary Lines 2-25
Sample Bandwidth-on-Demand Application 2-25

Using the Same Line for All Dial Services 2-26

Chapter 3
ISDN Overview

ISDN Standards 3-2
Basic Rate Interface 3-2
Primary Rate Interface 3-3
The D Channel 3-3
Link Access Procedure-D 3-3
Call Control on the D Channel 3-5
ISDN Interfaces 3-5
Functional Groups 3-5
Reference Points 3-6
For More Information about ISDN 3-8

Chapter 4
Implementation Notes
for All Dial Services

Point-to-Point Protocol 4-1
PPP Authentication 4-1
Types of Authentication 4-2
Two-Way Authentication 4-2
One-Way Authentication 4-3
Configuring the Type of Authentication 4-4
Using CHAP Names and PAP IDs for Authentication 4-4
Asynchronous PPP 4-6
Configuring Modems for Asynchronous PPP Interfaces 4-7
RADIUS Accounting Services 4-8
IP Adjacent Hosts 4-9
ISDN Services 4-10
BRI Service on the AN, ANH, ASN, and ARN 4-11
B Channel Support 4-11
D Channel Support 4-11
BRI Leased-Line Operation for Germany and Japan 4-12
BRI Subaddresses 4-12
Floating B Option for the AN and ANH 4-12
PRI Service on the ASN, BLN, and BCN 4-13

B Channel Support 4-13
D Channel Support 4-14
Selective PRI Service 4-14
PRI Multirate 4-15
Placing Multirate Calls 4-15
Incoming Call Filtering 4-16
Rate Adaption 4-16
X.25 Service over an ISDN D Channel (BRI only) 4-18
Configuring X.25 Service over the D Channel 4-19
Using the ping Command for ISDN Connections 4-20

Chapter 5
Dial-on-Demand Implementation Notes

Standby Circuits 5-1
Comparing Standby Circuits with Dial Backup Circuits 5-2
How Standby Circuits Work 5-3
Guidelines for Configuring Standby Circuits 5-4
Balancing Traffic between a Primary Circuit and a Hot Standby Circuit 5-5
Using Schedules to Manage Standby Circuit Availability 5-6
Configuring Multiple Time of Day Schedules 5-6
Callback 5-8
Configuring Callback 5-9
Modifying the Callback Mode Parameter 5-10
Callback and the Circuit's Connection Mode 5-10
Using the Incoming Phone List for Callback Service 5-11
Demand Circuit Groups 5-11
Demand Pools and Demand Circuit Groups 5-11
Caller Resolution for Demand Circuit Groups 5-12
Protocol Configuration for Demand Circuit Groups 5-13
Using Demand Circuit Groups with Dial Backup Service 5-13
RADIUS Authentication Services for Demand Circuit Groups 5-14
Managing Broadcast Traffic over Demand Circuits 5-14
Static Routes 5-15
Dial Optimized Routing 5-15
What Happens When You Enable Dial Optimized Routing 5-16
Enabling Dial Optimized Routing for Frame Relay Demand Circuits 5-16

Exceptions for Sending Routing Updates 5-17
Maintaining the Routing Table 5-17
IP RIP Triggered Updates and Broadcast Timers 5-18
IPX RIP and SAP Broadcast Timers 5-18
Traffic Filters 5-19
Data Compression 5-19
PPP Multilink 5-20
Protocol Prioritization 5-20

Chapter 6
Dial Backup Implementation Notes

Data Compression 6-1
Defining the Role of the Router in the Network 6-2
Bandwidth for Backup Circuits 6-2
Using Unnumbered Interfaces to Dial an Alternative Site 6-2
Sample Network Using Unnumbered Interfaces 6-3
Simplifying Unnumbered Configurations with Demand Circuit Groups 6-4
Sample Network Using Demand Circuit Groups 6-4

Chapter 7
Bandwidth-on-Demand Implementation Notes

Bandwidth-on-Demand Terminology 7-1
PPP Multilink 7-2
Multilink Fragmentation 7-3
PPP Bandwidth Allocation Protocol 7-4
How BAP Works 7-5
BAP Negotiation with Other Vendors' Routers 7-6
Configuring BAP 7-6
Protocol Prioritization 7-7
Defining the Role of the Router in the Network 7-7
Balancing Traffic between Lines in a Multilink Bundle 7-7
Ensuring the Accuracy of the Congestion Thresholds 7-8
Testing the Bandwidth-on-Demand Connection 7-8

Chapter 8
Customizing Line Pools

Adding Line Pools 8-1

Changing Pool IDs 8-2
Deleting Pools 8-3
Modifying the WAN Serial Interface Type and Line Media Type 8-4
Modifying Modem Configurations 8-6
Selecting a Modem (Hayes only) 8-8
Modifying Modem Initialization Commands 8-9
Modifying How the Modem Connects to the Network 8-10
Removing a Dial Service from a Modem Line 8-11
Modifying ISDN Configurations 8-12
Modifying BRI Signaling over the D Channel 8-12
Modifying the MCT1 and MCE1 Port Configurations 8-14
Changing PRI Timeslots 8-15
Modifying the ISDN Pool Channel Count and Priority 8-16
Modifying the ISDN Switch Type 8-18
Enabling Incoming Call Filtering 8-19
Modifying the Adaption Rate 8-19
Informing the Switch That Call Setup Is Complete 8-20
Configuring X.25 over a D Channel (BRI only) 8-20
Disabling X.25 over the D Channel 8-21
Modifying the BRI Line That Uses X.25 Service over the D Channel 8-22
Modifying the X.25 Circuit for Service over the D Channel 8-23
Configuring a BRI Leased Line (Germany and Japan only) 8-24
Modifying BRI Leased-Line Configurations 8-26
Removing B Channels from a Pool 8-27
Removing BRI and PRI from the Router 8-28
Removing BRI 8-28
Removing PRI 8-29

Chapter 9
Customizing Demand Circuits

Configuring Frame Relay Demand Circuits 9-2
Modifying the Frame Relay Interface 9-5
Modifying Frame Relay Service Records 9-6
Adding Protocols to Frame Relay Demand Circuits 9-8
Customizing PPP and Frame Relay Demand Circuits 9-10
Changing the Default Authentication Protocol (PPP only) 9-11

Bandwidth-on-Demand Service for Demand Lines (PPP only) 9-12
Adding Protocols to PPP Demand Circuits 9-12
Scheduling When the Demand Circuit Is Available 9-13
Configuring Demand Circuit Groups 9-16
Caller Resolution Information for Demand Circuit Groups 9-17
Modifying the Demand Circuit Group Configuration 9-20
Modifying the Number of Circuits in a Demand Circuit Group 9-20
Modifying the Demand Pool That the Demand Circuit Group Uses 9-21
Removing a Demand Circuit Group 9-22
Removing Demand Circuits 9-23

Chapter 10
Customizing Backup Circuits

Creating a PPP Backup Circuit for One Frame Relay PVC 10-2
Creating Frame Relay Backup Circuits for Multiple PVCs 10-5
Modifying the Frame Relay Backup Interface 10-7
Modifying Frame Relay Service Records 10-9
Configuring Filters for Backup Configurations 10-12
Configuring Filters for Primary/Secondary Interfaces 10-12
Configuring Filters for Primary/Shared Interfaces 10-13
Customizing PPP and Frame Relay Backup Circuits 10-14
Changing the Authentication Protocol for the Primary Circuit 10-14
Scheduling When the Backup Circuit Is Available 10-15
Removing PPP or Frame Relay Backup Service 10-17

Chapter 11
Customizing Bandwidth-on-Demand Circuits

Customizing Bandwidth-on-Demand Service 11-2
Changing the Authentication Protocol 11-3
Monitoring Congestion on the Bandwidth or Demand Circuit 11-4
Setting the Preferred and Reserved Slots 11-7
Setting the Preferred and Reserved Slots For BAP 11-8
Modifying Multilink Fragmentation 11-9
Enabling BAP for Bandwidth-on-Demand Service 11-10
Removing Bandwidth-on-Demand Service 11-13

Chapter 12
Customizing Phone Lists

Types of Phone Lists 12-1
How ISDN Calls Use Phone Lists 12-2
Outgoing and Incoming Phone Lists 12-2
Local Phone Lists 12-2
How V.25bis and Hayes Calls Use the Outgoing Phone List 12-2
Creating an Outgoing Phone List 12-3
Modifying the Outgoing Phone List 12-7
Enabling PRI Multirate 12-8
Creating an Incoming Phone List (ISDN only) 12-9
Modifying the Incoming Phone List 12-11
Creating a Local Phone List (ISDN only) 12-12

Chapter 13
Customizing Caller Resolution

Caller Resolution for Demand Circuit Groups 13-1
Adding Entries to the Caller Resolution Table 13-2
Modifying Entries in the Caller Resolution Table 13-6

Appendix A
Dial Service Parameters

Pool ID Parameter A-4
WAN Serial Interface Type Parameter A-4
Sync and Async Line Media Type Parameters A-5
External Modem Parameters A-7
V.34 Modem Parameters A-12
BRI Port Application Mode Parameter A-15
PRI Port Application Mode Parameter A-16
ISDN Switch Parameters A-16
Pool Channel Count and Priority Parameters A-20
BRI Configuration Parameters A-22
Demand Circuit Parameters (PPP and Frame Relay) A-26
Standby Circuit Parameters (PPP Demand Circuits only) A-32
Callback Parameters (PPP Demand Circuits only) A-34
Authentication Protocol Parameters (Demand, Backup, Bandwidth) A-37
Circuit Duration Parameters (Demand and Backup) A-42

Circuit Schedule Parameters (Demand and Dial Backup) A-45
Demand Circuit Group Parameters A-51
Caller Resolution Info Parameters for Demand Circuit Groups A-52
Demand Circuit Group Protocol Parameters A-54
PPP Circuit Options Parameters (Dial Backup) A-57
PPP Primary Circuit Definition Parameters (Dial Backup) A-58
Frame Relay Interface Type Parameter (Dial Backup) A-59
Frame Relay Primary Interface Definition Parameters (Dial Backup) A-61
Frame Relay Interface Parameters (Demand and Dial Backup) A-62
Service List Parameter (Demand and Dial Backup) A-71
Frame Relay PVC Parameters (Demand and Dial Backup) A-72
Bandwidth-on-Demand Circuit Options Parameters A-77
Bandwidth-on-Demand Circuit Definition Parameters A-79
Bandwidth-on-Demand Congestion Monitor Parameters A-80
Bandwidth Allocation Protocol (BAP) Parameters A-86
Local Phone Number Parameters A-87
Outgoing Phone List Parameters A-90
Incoming Phone List Parameters A-100
Caller Resolution Table Parameters A-102

Appendix B
Configuration Examples

Dial-on-Demand with PPP B-2
Configuration of Routers 4 and 7 ..... B-3
Demand Pool Configuration B-3
Demand Circuit Configuration B-4
Outgoing Phone List Configuration B-5
Caller Resolution Table Configuration B-5
Dial-on-Demand for an ISDN Network B-6
Configuration of Router 1 ..... B-6
Configuration of Router 2 ..... B-7
Port Application Mode Configuration B-7
Demand Pool Configuration B-8
Demand Circuit Configuration B-9
Outgoing Phone List B-9
Protocol Configuration B-10

Caller Resolution Table Configuration B-11
Local Phone Number Configuration B-11
Dial Backup with PPP on the Primary Line B-12
Configuration of Router 1 ..... B-12
Configuration of Router 2 ..... B-13
Backup Pool Configuration B-13
Backup Circuit Configuration B-14
Outgoing Phone List Configuration B-15
Caller Resolution Table Configuration B-16
Dial Backup with Standard on the Primary Line B-17
Dial Backup over an ISDN Network B-18
Configuration of Router 1 ..... B-18
Configuration of Router 2 ..... B-19
Port Application Mode Configuration B-19
Backup Pool Configuration B-20
Backup Circuit Configuration B-20
Outgoing Phone List B-22
Caller Resolution Table Configuration B-22
Local Phone Number Configuration B-23
Configuring Dial Backup with Standard or Frame Relay B-23

Appendix C
Dial Services Parameter Defaults

Appendix D
Ordering ISDN Lines in the United States

Ordering BRI Lines D-1
Ordering PRI Lines D-2

Appendix E
AT Initialization Commands for the ARN

Index

Figures

Figure 1-1. Dialup Menu from the Configuration Manager Window 1-5
Figure 1-2. Demand Pools Window 1-6
Figure 1-3. Demand Pool Configuration Window 1-6
Figure 1-4. Demand Lines Definition Window for a Backbone Link Node 1-7
Figure 1-5. Choose WAN Serial Interface Type Window 1-8
Figure 1-6. Sync Line Media Type Window 1-9
Figure 1-7. Async Line Media Type Window 1-9
Figure 1-8. Port Application Window 1-11
Figure 1-9. Clock Parameters Window 1-12
Figure 1-10. MCT1 Port Parameters Window 1-13
Figure 1-11. PRI Logical Lines Window 1-14
Figure 1-12. MCT1 Timeslots Window 1-15
Figure 1-13. Menu for PRI Timeslot 1-15
Figure 1-14. ISDN Switch Configuration Window 1-17
Figure 1-15. ISDN Logical Lines Window 1-18
Figure 1-16. Demand Pools Window Listing Configured Pools 1-19
Figure 1-17. PPP Demand Circuits Window 1-20
Figure 1-18. Completed PPP Demand Circuits Window 1-21
Figure 1-19. Select Protocols Window 1-23
Figure 1-20. Primary Circuit Definition Window 1-25
Figure 1-21. Circuit Options Window 1-26
Figure 1-22. Bandwidth-on-Demand Circuit Definition Window 1-29
Figure 1-23. Circuit Options Window 1-29
Figure 1-24. Preferred/Reserved Slots for BOD Pool Window 1-31
Figure 1-25. PPP Demand Circuits Window 1-33
Figure 1-26. Enter a BOD Pool Window 1-34
Figure 1-27. BOD Configuration Window 1-35
Figure 1-28. Outgoing Phone List Window 1-36
Figure 1-29. Phone Number Window 1-37

Figure 1-30. ISDN Local Phone Lines Window 1-38
Figure 1-31. ISDN Local Phone Numbers Window 1-39
Figure 1-32. Phone Number Window 1-39
Figure 1-33. Caller Resolution Table Window 1-41
Figure 1-34. Caller Name and Secret/Password Window 1-41
Figure 1-35. Local Circuit List Window 1-42
Figure 2-1. Example of Dial Access to a Switched Telephone Network 2-2
Figure 2-2. Dial-on-Demand Service 2-5
Figure 2-3. Example of Demand Lines, Pools, and Circuits 2-6
Figure 2-4. Dial-on-Demand Connection over a Frame Relay Network 2-7
Figure 2-5. Additional Lines for a Dial-on-Demand Connection 2-12
Figure 2-6. PPP Backup over a PSTN 2-14
Figure 2-7. PPP Backup over an ISDN Network 2-15
Figure 2-8. Link Backup for a Frame Relay Network 2-15
Figure 2-9. Example of Backup Pools, Lines, and Circuits 2-18
Figure 2-10. An Example of Bandwidth-on-Demand Service 2-22
Figure 2-11. Sample Bandwidth-on-Demand Network 2-25
Figure 3-1. Sample ISDN Network 3-1
Figure 3-2. The BRI Interface 3-2
Figure 3-3. LAPD Frame 3-4
Figure 3-4. Reference Points and Functional Groups for Devices 3-7
Figure 3-5. Reference Points and Functional Groups for Non-ISDN Devices 3-7
Figure 4-1. Two-Way Authentication 4-2
Figure 4-2. One-Way Authentication 4-3
Figure 4-3. Routers Using CHAP for Authentication 4-4
Figure 4-4. Using Asynchronous PPP over Modem Lines 4-6
Figure 4-5. IP Adjacent Hosts 4-9
Figure 4-6. Router in an ISDN Network 4-10
Figure 4-7. Rate Adaption for a Network with a 56 Kb/s Trunk Line 4-17
Figure 4-8. Rate Adaption for a Switched 56 Kb/s Network 4-17
Figure 4-9. X.25 over the D Channel 4-19
Figure 5-1. Example of Callback over a Demand Circuit 5-8
Figure 6-1. Dialing an Alternative Router Using IP Unnumbered Interfaces 6-3
Figure 6-2. Dialing an Alternative Router Using Demand Circuit Groups 6-5
Figure 7-1. Multilink and Bandwidth-on-Demand Operation 7-3

Figure 7-2. BAP Negotiation between Two Routers 7-5
Figure 8-1. Demand Pools Window 8-2
Figure 8-2. Edit Connector Window 8-4
Figure 8-3. Edit Connector Window 8-6
Figure 8-4. Sync Modem Interface Window 8-7
Figure 8-5. Async Hayes Modem Interface Window 8-7
Figure 8-6. ISDN Dialup Window 8-12
Figure 8-7. BRI Interface Configuration Window 8-13
Figure 8-8. PRI Logical Lines Window 8-14
Figure 8-9. Timeslots Window 8-15
Figure 8-10. ISDN Logical Lines Window 8-17
Figure 8-11. ISDN Configured Switches Window 8-18
Figure 8-12. Edit Connector Window 8-22
Figure 8-13. Circuit Definition Window 8-23
Figure 8-14. ISDN Leased Line B Channels Window 8-24
Figure 8-15. Add Circuit Window 8-25
Figure 8-16. WAN Protocols Menu 8-25
Figure 8-17. BRI Interface Configuration Window for the BRI T4 Timer 8-26
Figure 8-18. ISDN Dialup Window 8-28
Figure 9-1. Demand Pools Window 9-2
Figure 9-2. FR Demand Circuits Window 9-3
Figure 9-3. Completed FR Demand Circuits Window 9-4
Figure 9-4. FR Demand Interface List Window 9-5
Figure 9-5. Frame Relay Demand Service List Window 9-6
Figure 9-6. FR PVC List for Demand Services Window 9-7
Figure 9-7. Frame Relay PVC Add Window 9-8
Figure 9-8. Select Protocols Window 9-9
Figure 9-9. Circuit Time of Day Schedule Window 9-13
Figure 9-10. Circuit Time of Day Schedule Window 9-14
Figure 9-11. Completed Circuit Time of Day Schedule Window 9-15
Figure 9-12. Demand Circuit Groups Window 9-16
Figure 9-13. Enter a Demand Pool Window 9-17
Figure 9-14. Caller Resolution Info Window 9-18
Figure 9-15. Completed Demand Circuit Groups Window 9-19
Figure 9-16. Demand Circuit Group Window 9-21

Figure 10-1. Primary Circuit Definition Window 10-2
Figure 10-2. Circuit Options Window 10-3
Figure 10-3. Completed Primary Circuit Definition Window 10-4
Figure 10-4. FR Primary Interface Definition Window 10-5
Figure 10-5. FR Interface Window 10-6
Figure 10-6. Completed FR Primary Interface Definition Window 10-7
Figure 10-7. FR Backup Interface Window for Primary/Shared Interfaces 10-8
Figure 10-8. Frame Relay Backup Service List Window 10-9
Figure 10-9. Frame Relay Backup PVC List Window 10-10
Figure 10-10. Frame Relay PVC Add Window 10-11
Figure 10-11. Priority/Outbound Filters Window 10-12
Figure 10-12. Circuit Time of Day Schedule Window 10-15
Figure 10-13. Circuit Time of Day Schedule Window 10-16
Figure 10-14. Completed Circuit Time of Day Schedule Window 10-16
Figure 11-1. Bandwidth-On-Demand Circuit Definition Window 11-2
Figure 11-2. Bandwidth On Demand Monitor Options Window 11-5
Figure 11-3. Bandwidth-On-Demand Pools Window 11-7
Figure 11-4. Preferred/Reserved Slots for BOD Pool Window 11-8
Figure 11-5. Circuit List Window 11-10
Figure 11-6. Circuit Definition Window 11-11
Figure 11-7. Edit BAP Circuit Interface Window 11-12
Figure 11-8. Circuit Options Window 11-13
Figure 12-1. Primary Circuit Definition Window 12-3
Figure 12-2. Outgoing Phone List Window 12-4
Figure 12-3. Phone Number Window 12-5
Figure 12-4. Completed Outgoing Phone List Window 12-6
Figure 12-5. Incoming Phone List Window 12-9
Figure 12-6. Phone Number Window 12-10
Figure 12-7. Completed Incoming Phone List Window for ISDN 12-11
Figure 12-8. ISDN Local Phone Lines Window 12-12
Figure 12-9. ISDN Local Phone Numbers Window 12-13
Figure 12-10. Phone Number Window 12-13
Figure 13-1. Caller Resolution Table Window 13-2
Figure 13-2. Caller Name and Secret/Password Window 13-3
Figure 13-3. Local Circuit List Window 13-4

Figure 13-4. Completed Caller Resolution Table Window 13-5
Figure B-1. Dial-on-Demand Configuration with PPP B-2
Figure B-2. Dial-on-Demand for an ISDN Network B-6
Figure B-3. Dial Backup Configuration with PPP B-12
Figure B-4. Dial Backup over an ISDN Network B-18

Tables

Table 1-1. Dial Service Names 1-2
Table 1-2. Setting Up a Default Modem or ISDN Configuration 1-4
Table 2-1. Dial Service Names 2-2
Table 2-2. Primary and Backup Lines 2-13
Table 2-3. Primary and Backup Circuit Protocols 2-13
Table 5-1. Time of Day Schedules for Standby Circuit 1 5-6
Table 6-1. Configuration Requirements for Routers A and C 6-4
Table 7-1. Terminology for Bandwidth-on-Demand Service 7-1
Table 8-1. Modem Interface Windows 8-6
Table 9-1. Customizing Demand Circuits 9-10
Table 10-1. Dial Backup Configurations 10-1
Table 10-2. Customizing Backup Circuits 10-14
Table 11-1. Terminology for Bandwidth-on-Demand Service 11-1
Table 11-2. Customizing Bandwidth-on-Demand Service 11-3
Table 11-3. Changing the Monitor Parameters 11-6
Table 12-1. Customizing the Outgoing Phone List 12-8
Table A-1. Organization of Parameters A-1
Table A-2. Abbreviated Site Manager Window Titles A-3
Table A-3. Switch Types by Country A-17
Table B-1. Demand Pools Parameter B-3
Table B-2. Line Media Type Parameters B-3
Table B-3. IP Parameters B-4
Table B-4. IP Adjacent Host Parameter B-4
Table B-5. PPP Demand Circuits Parameters B-4
Table B-6. Outgoing Phone List Parameter B-5
Table B-7. Caller Resolution Table Parameters B-5
Table B-8. Port Application Mode Parameter B-7
Table B-9. MCT1 Clock Parameter (Router 1 only) B-7
Table B-10. Demand Pools Parameter B-8

Table B-11. ISDN Switch Configuration Parameter B-8
Table B-12. PPP Demand Circuits Parameters B-9
Table B-13. Outgoing Phone List Parameter B-9
Table B-14. IP Parameters B-10
Table B-15. IP Adjacent Host Parameter B-10
Table B-16. Caller Resolution Table Parameters B-11
Table B-17. Local Phone Number Parameters B-11
Table B-18. Backup Pools Parameter B-13
Table B-19. Circuit Options Parameters B-14
Table B-20. Primary Circuit Definition Parameters B-15
Table B-21. Outgoing Phone List Parameter B-15
Table B-22. Caller Resolution Table Parameters (Router 2 only) B-16
Table B-23. IP Parameter B-17
Table B-24. IP Adjacent Host Parameters B-17
Table B-25. Port Application Parameter B-19
Table B-26. Backup Pools Parameter B-20
Table B-27. ISDN Switch Configuration Parameter B-20
Table B-28. Circuit Options Parameters B-21
Table B-29. Primary Circuit Definition Parameters B-21
Table B-30. Outgoing Phone List Parameter B-22
Table B-31. Caller Resolution Table Parameters (Router 2 only) B-22
Table B-32. Local Phone Numbers Parameters B-23
Table C-1. Line Pool Parameters C-1
Table C-2. Line Media Type Parameters C-1
Table C-3. Modem Interface Parameters C-2
Table C-4. Port Application Mode Parameters C-2
Table C-5. Logical Lines Parameter C-3
Table C-6. ISDN Switch Parameters C-3
Table C-7. ISDN Logical Lines Parameters C-3
Table C-8. Local Phone Number Parameters C-4
Table C-9. BRI Interface Parameters C-4
Table C-10. Demand Circuit Parameters C-5
Table C-11. Demand Circuit Group Parameters C-6
Table C-12. Primary/Backup Circuit Parameters C-7
Table C-13. Bandwidth-on-Demand Circuit Parameters C-8

Table C-14. Outgoing Phone List Parameters C-9
Table C-15. Incoming Phone List Parameters C-9
Table C-16. Caller Resolution Table Parameters C-10
Table D-1. BRI Parameters for the AT&T 5ESS Switch D-1
Table D-2. BRI Parameters for the Northern Telecom DMS-100 Switch D-2
Table E-1. Summary of AT Modem Initialization Commands E-1

About This Guide

If you are responsible for configuring dial services, you need to read this guide.

If you want to	Go to
Start a dial service on a router, using a default configuration	Chapter 1
Learn about all three dial services	Chapter 2
Learn about Integrated Services Digital Network (ISDN) communication	Chapter 3
Learn about special aspects of the Bay Networks implementation of each dial service	Chapter 4 through Chapter 7
Change default settings for dial service parameters	Chapter 8 through Chapter 13
Obtain information about Site Manager parameters (this is the same information you obtain using Site Manager online Help)	Appendix A
Review some configuration examples	Appendix B
Learn parameter defaults	Appendix C
Obtain information for ordering ISDN lines in the United States	Appendix D
Use an AT command string for modem configurations	Appendix E

Before You Begin

Before using this guide, you must complete the following procedures. For a new router:

- Install the router (refer to the installation manual that came with your router).
- Connect the router to the network and create a pilot configuration file (refer to *Quick-Starting Routers*, *Configuring BayStack Remote Access*, or *Connecting ASN Routers to a Network)*.

Make sure that you are running the latest version of Bay Networks Site Manager and router software. For instructions, refer to *Upgrading Routers from Version 7–11.xx to Version 12.00*.

Conventions

bold text	Indicates text that you need to enter, command names, and buttons in menu paths. Example: Enter **wfsm &**
	Example: Use the **dinfo** command.
	Example: ATM DXI > Interfaces > **PVCs** identifies the PVCs button in the window that appears when you select the Interfaces option from the ATM DXI menu.
italic text	Indicates variable values in command syntax descriptions, new terms, file and directory names, and book titles.
quotation marks (“ ”)	Indicate the title of a chapter or section within a book.
`screen text`	Indicates data that appears on the screen. Example: `Set Bay Networks Trap Monitor Filters`
separator (>)	Separates menu and option names in instructions and internal pin-to-pin wire connections. Example: Protocols > AppleTalk identifies the AppleTalk option in the Protocols menu.
	Example: Pin 7 > 19 > 20

vertical line (|)	Indicates that you enter only one of the parts of the command. The vertical line separates choices. Do not type the vertical line when entering the command. Example: If the command syntax is **show at routes | nets**, you enter either **show at routes** or **show at nets**, but not both.

Acronyms

AURP	AppleTalk Update Routing Protocol
BACP	Bandwidth Allocation Control Protocol
BAP	Bandwidth Allocation Protocol
BofL	Breath of Life
BRI	Basic Rate Interface
CHAP	Challenge Handshake Authentication Protocol
CSU	channel service unit
DLCI	Data Link Connection Identifier
DLCMI	Data Link Control Management Interface
DSL	Digital Subscriber Loop
DSU	data service unit
ET	exchange termination
HDLC	High-level Data Link Control
IP	Internet Protocol
IPX	Internet Packet Exchange
ISDN	Integrated Services Digital Network
ITU-T	International Telecommunication Union–Telecommunications
LAN	local area network
LAPD	Link Access Procedure-D
LCP	Link Control Protocol
LQR	Link Quality Report
LT	line terminator
NT	network terminator
PAP	Password Authentication Protocol
PH	packet handling

PPP	Point-to-Point Protocol
PRI	Primary Rate Interface
PSPDN	Packet Switched Public Data Network
PSTN	Public Switched Telephone Network
PVC	permanent virtual circuit
RADIUS	Remote Access Dial-In User Services
RIP	Routing Information Protocol
SAP	Service Advertising Protocol
SAPI	service access point identifier
SPID	Service Profile Identifier
SVC	switched virtual circuit
TA	terminal adapter
TE	terminal equipment
TEI	terminal endpoint identifier
UNI	user network interface
WAN	wide area network
XNS	Xerox Network System

Ordering Bay Networks Publications

To purchase additional copies of this document or other Bay Networks publications, order by part number from Bay Networks Press™ at the following numbers:

- Phone--U.S./Canada: 888-422-9773
- Phone--International: 510-490-4752
- FAX--U.S./Canada and International: 510-498-2609

The Bay Networks Press catalog is available on the World Wide Web at *support.baynetworks.com/Library/GenMisc*. Bay Networks publications are available on the World Wide Web at *support.baynetworks.com/Library/tpubs*.

Bay Networks Customer Service

You can purchase a support contract from your Bay Networks distributor or authorized reseller, or directly from Bay Networks Services. For information about, or to purchase a Bay Networks service contract, either call your local Bay Networks field sales office or one of the following numbers:

Region	Telephone number	Fax number
United States and Canada	800-2LANWAN; then enter Express Routing Code (ERC) 290, when prompted, to purchase or renew a service contract 508-916-8880 (direct)	508-916-3514
Europe	33-4-92-96-69-66	33-4-92-96-69-96
Asia/Pacific	61-2-9927-8888	61-2-9927-8899
Latin America	561-988-7661	561-988-7550

Information about customer service is also available on the World Wide Web at *support.baynetworks.com*.

How to Get Help

If you purchased a service contract for your Bay Networks product from a distributor or authorized reseller, contact the technical support staff for that distributor or reseller for assistance.

If you purchased a Bay Networks service program, call one of the following Bay Networks Technical Solutions Centers:

Technical Solutions Center	Telephone number	Fax number
Billerica, MA	800-2LANWAN	508-916-3514
Santa Clara, CA	800-2LANWAN	408-495-1188
Valbonne, France	33-4-92-96-69-68	33-4-92-96-69-98
Sydney, Australia	61-2-9927-8800	61-2-9927-8811
Tokyo, Japan	81-3-5402-0180	81-3-5402-0173

Chapter 1
Getting Started

A *dial service* provides access to a central switched network for remote users, such as people in branch offices, telecommuters, and sales people in the field. To make these remote connections, dial services use dial-up lines (also called *switched lines*), which are activated when there is data to send across the network or when a failed or congested leased line needs a secondary dial-up connection. Dial-up lines can be a cost-effective alternative to leased lines and packet networks, which are permanent connections that are available regardless of network traffic.

This manual describes three dial services: dial-on-demand, dial backup, and bandwidth-on-demand. In this chapter, you will perform a basic dial service configuration--that is, a configuration using all available defaults. Setting up a basic configuration will familiarize you with the configuration tasks. Subsequent chapters explain how to customize the configuration to suit your needs.

How to Use This Manual

Understanding how this manual is organized should make it more useful to you. The manual is organized as follows:

- Getting Started, which explains how to set up a basic configuration using all of the defaults.

  Begin by reading this chapter. This gives you a general idea of the configuration tasks you will perform; however, it does not describe many features that you may want to implement for your network.

- Overviews and features of each dial service.

  This information is included in Chapters 2 through 7.

- Instructions for modifying the default configuration in Chapter 1.

  These instructions are in Chapters 8 through 13. Most of the instructions assume that you have read Chapter 1 and explain how to modify the configuration.

  In the procedures, any step that instructs you to set a parameter value is followed by a box that includes the Site Manager parameter and the location of the parameter description in Appendix A. To read more about the parameter before specifying a value, refer to the specified page.

- Appendixes that include parameter descriptions, configuration examples, parameter default tables, ISDN ordering information, and a list of AT modem initialization commands.

The names of the dial services are sometimes abbreviated in this manual. Table 1-1 lists the full and abbreviated names of each dial service.

Table 1-1. Dial Service Names

Full Name	Abbreviated Name
Dial-on-demand	Demand
Dial backup	Backup
Bandwidth-on-demand	Bandwidth

Before You Begin

Before you configure a dial service, you should have done the following:

- Installed the router.
- Installed either ISDN or modem lines.
- Ordered Integrated Services Digital Network (ISDN) service (if applicable) and received the information for setting up ISDN configurations (for example, switch type and phone numbers). Refer to Appendix D for information on ordering ISDN lines in the United States.
- Ordered and configured external modems (if applicable).
- Decided whether to use the Challenge Handshake Authentication Protocol (CHAP) or the Password Authentication Protocol (PAP) for Point-to-Point Protocol (PPP) connections.

In addition, you should have read *Configuring and Managing Routers with Site Manager* and done the following:

- Selected a COM, MCT1, or MCE1 port and configured a leased interface only (dial backup or bandwidth-on-demand service only). When you configure dial-up circuits, you designate these leased interfaces as dial backup primaries or bandwidth circuits. You do not need to do this for dial-on-demand service, even if you configure demand circuits to use bandwidth-on-demand service.
- Opened a configuration file.
- Selected the router hardware modules, if this is a local mode configuration.

  Chapter 2 of this manual lists the types of leased lines that you can select. Refer to *Configuring and Managing Routers with Site Manager* for instructions on setting up leased interfaces.

Setting Up a Dial Service

Each dial service has many configurable parameters, but for a basic configuration, you change only a subset of these parameters.

Setting up a dial service involves three main tasks:

1. Enabling a physical interface
2. Creating line pools
3. Assigning and configuring circuits that use the configured line pools

Each task involves several steps.

Table 1-2 on page 1-4 lists the basic tasks required to set up a dial service. These tasks apply to modem and ISDN configurations. This basic configuration assumes the following:

- Your router interfaces are synchronous.
- PPP is the layer 2 protocol.
- IP is the layer 3 protocol.
- There is no ISDN caller ID service; therefore, no incoming phone list is required.

This basic configuration does not address every application.

Table 1-2. Setting Up a Default Modem or ISDN Configuration

Task	Parameters to Set	DOD[a]	DB	BOD
1. Create a line pool and assign an ID to the pool **ISDN interfaces only:** Before creating a line pool, select an ISDN port and configure it for BRI or PRI service.	Pool ID Port Application Mode	x	x	x
2. Add one or more lines to the pool and, for modem lines, configure the interface. For ISDN lines, the interface is defined before adding the line to the pool.	None (accept the default)	x	x	x
3. Designate the ISDN switch type (ISDN only)	Switch Type	x	x	x
4. Specify a local phone number (ISDN only)	Directory Number Service Provider ID (SPID) for United States and Canada only	x	x	x
5. Add a demand, backup, or bandwidth circuit	Pool ID	x	x	x
6. Specify the leased-line connection type	Circuit Type		x	x
	Backup Pool ID		x	
	Bandwidth-on-Demand Pool ID			x
7. Specify authentication protocol information (CHAP is the default protocol.)	CHAP Local Name	x	x	x
	CHAP Secret	x	x	x
8. Specify the circuit connection mode	Demand Connection Mode	x		
	Backup Mode		x	
	Bandwidth Mode			x
9. Add protocols (This chapter uses IP as an example.)	IP Address IP Adjacent Host	x		
10. Create an outgoing phone list	Outgoing Phone Number Outgoing Phone Ext/SubAddr	x	x	x
11. Set up the caller resolution table	Caller Name CHAP Secret	x	x	x

a. Abbreviations: **DOD**=dial-on-demand, **DB**=dial backup, **BOD**=bandwidth-on-demand

If you need to refer to a parameter description, click on Help in the Site Manager window or refer to Appendix A of this manual.

Configuring Line Pools

A *line pool* is a group of one or more lines that reside on the router slots. You identify each pool by assigning a *pool ID*. The lines are the physical connections over which the circuits transmit and receive data. Each line can connect to a modem or directly to an ISDN network (using a router with integral ISDN). A line pool can have a combination of synchronous and asynchronous interface types.

The steps for creating line pools are the same for all three dial services. The steps for adding modem lines (Raise DTR, V.25bis, and Hayes) and ISDN lines to a pool are different. Refer to the appropriate section for instructions:

- "Creating Line Pools with Modem Lines"
- "Creating Line Pools with ISDN Lines" on page 1-11

Creating Line Pools with Modem Lines

To configure line pools with Raise DTR, V.25bis, and Hayes interfaces:

1. **From the Configuration Manager window, select Dialup > Demand Pools, Backup Pools, or Bandwidth On Demand Pools (Figure 1-1).**

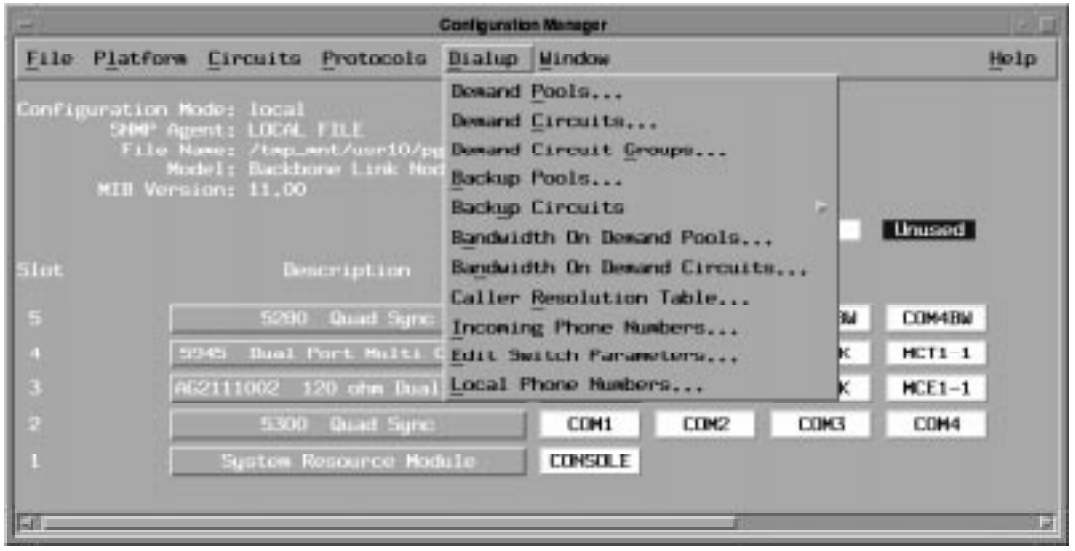


Figure 1-1. Dialup Menu from the Configuration Manager Window

Site Manager displays the Pools window (Figure 1-2).

Note: To avoid repetition, this section shows only the demand configuration windows. The backup and bandwidth windows are similar, but may have different titles.

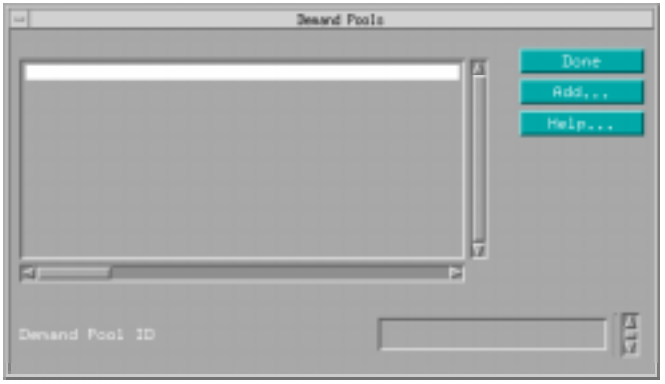


Figure 1-2. Demand Pools Window

2. **Click on Add.**

   Site Manager displays the Pool Configuration window (Figure 1-3).

Figure 1-3. Demand Pool Configuration Window

3. **Enter a Pool ID and click on OK.**

Site Manager: Demand/Backup/Bandwidth Pool ID parameter: page A-4

Note: You can use the same ID for a demand, backup, or bandwidth pool, but you cannot use the same ID for two of the same type of pool.

Site Manager displays the Lines Definition window (Figure 1-4).

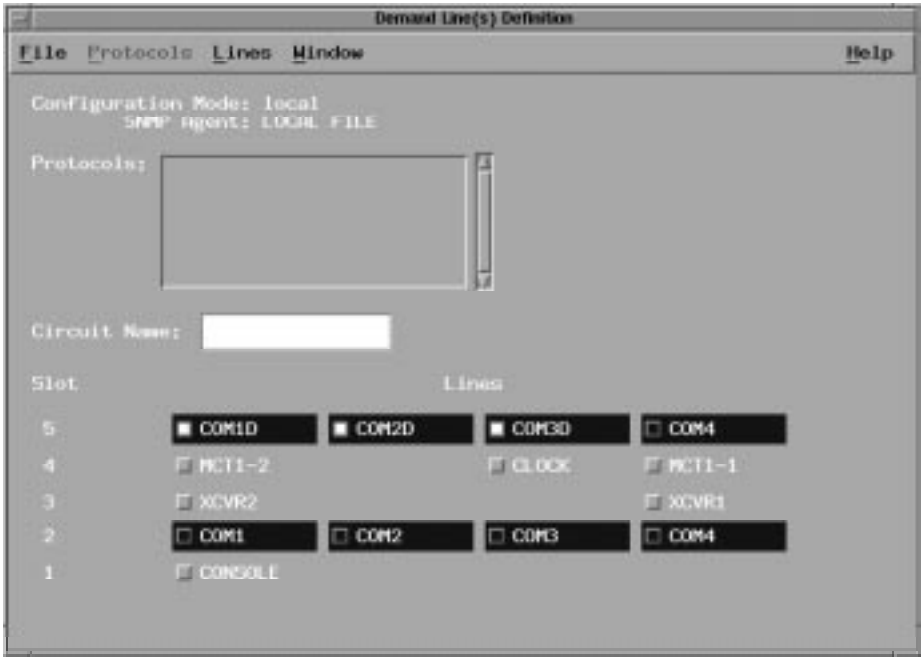


Figure 1-4. Demand Lines Definition Window for a Backbone Link Node

4. **Click on an available COM connector to assign a line to the pool, but consider the following:**
   - Do not select any COM lines that you previously configured as leased lines.
   - The lines that you select for a demand pool must reside on the same slot.
   - The lines that you select for a backup and bandwidth pool can reside across slots.

Site Manager displays the Choose WAN Serial Interface Type window (Figure 1-5).

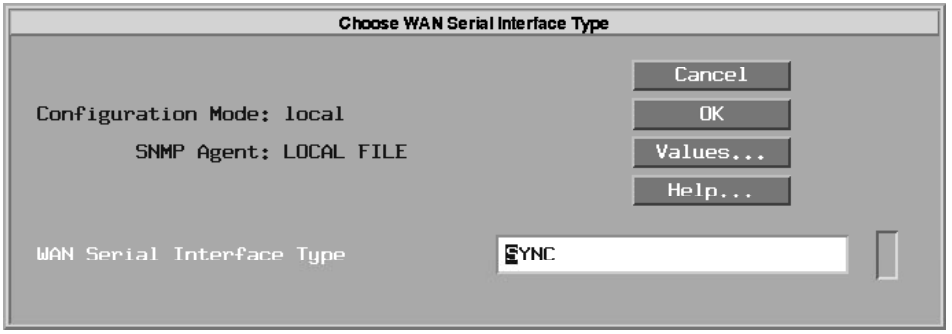


Figure 1-5. Choose WAN Serial Interface Type Window

Note: On the BLN® and Backbone Concentrator Node (BCN®), the Choose WAN Serial Interface Type window appears only for ports on an Octal Sync Link Module. For all other modules, the Sync Line Media Type window (Figure 1-6) appears.

5. **Accept the default, Sync, or click on Values and select Async.**

Site Manager: WAN Serial Interface Type parameter: page A-4

If you plan to use Asynchronous PPP for your dial connections, you may want to select Async for the WAN serial interface type. After selecting an interface type, Site Manager displays the Sync Line Media Type window (Figure 1-6) or the Async Line Media Type window (Figure 1-7).

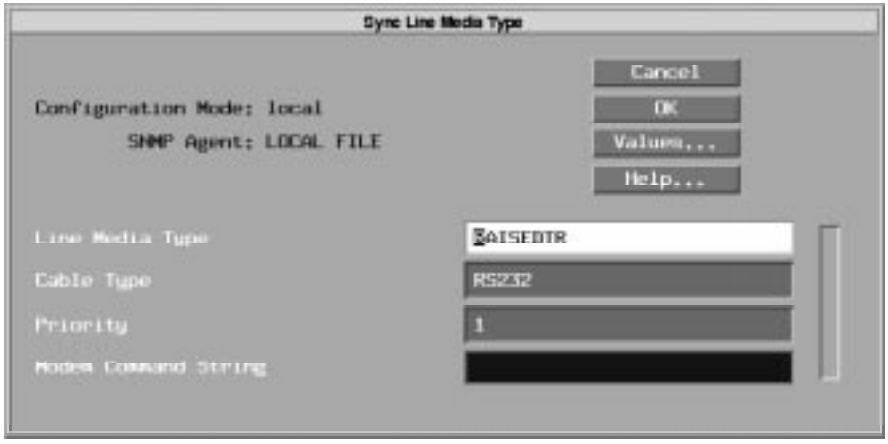


Figure 1-6. Sync Line Media Type Window

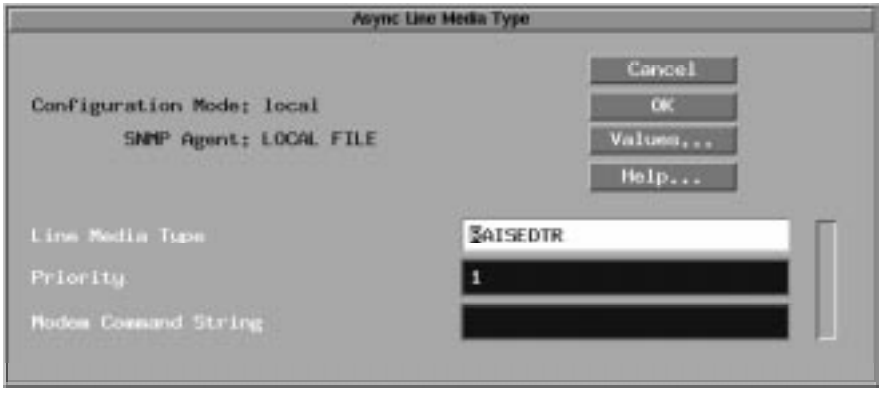


Figure 1-7. Async Line Media Type Window

6. **Click on OK to accept the line media default, Raise DTR.**

   At this point, you may want to select V.25bis or Hayes as the line media type rather than accept the default.

   For Hayes signaling, you need to specify a modem initialization string for modem dialing (refer to Chapter 8 to modify modem parameters). For both options, you need to configure an outgoing phone list (refer to "Creating an Outgoing Phone List" on page 1-36).

Site Manager: Line Media Type parameter: page A-5

   You return to the Lines Definition window. The letter D (demand), B (backup), or W (bandwidth) appears next to the COM port to indicate what type of line it is. Note that the router can use the same line for all three types of pools. Asynchronous ports have an at sign (@) next to the connector name.

7. **Select and configure more lines for the pool, if necessary.**

8. **Select File > Exit to exit the Lines Definition window (refer to Figure 1-4).**

   You return to the Pools window with three new buttons (Edit, Apply, and Delete) that allow you to edit the new pool.

9. **Now that you have set up a pool, do one of the following:**

   - Go to "Configuring Circuits" on page 1-19 to configure dial-up circuits.
   - Go to the next section to add ISDN lines to the pool.

Creating Line Pools with ISDN Lines

Before creating a pool with ISDN lines, you need to select a port and designate it as a BRI or PRI interface. Refer to the appropriate section for instructions:

- "Configuring BRI Lines"
- "Configuring PRI Lines" on page 1-12

Configuring BRI Lines

ISDN/BRI Net Modules are available only on the Access Node (AN®), Access Stack Node (ASN™), Access Node Hub (ANH™), and Access Remote Node (ARN™) hardware platforms. To configure BRI lines:

1. **Begin at the Configuration Manager window (refer to Figure 1-1).**
2. **Click on an ISDN connector.**

   Site Manager displays the Port Application window (Figure 1-8).

Figure 1-8. Port Application Window

3. **Accept the default, Dialup 2B+D, and click on OK.**

   You return to the Configuration Manager window.

Site Manager: Port Application Mode parameter: page A-15

4. **Repeat steps 1 through 3 for each BRI line you want in the pool.**
5. **Go to "Adding ISDN Lines to a Pool" on page 1-16.**

Configuring PRI Lines

PRI lines are available only on the ASN™, BCN, and BLN hardware platforms using the following link modules:

- Single or Dual Port Multichannel T1 Link Module (BLN and BCN)
- Dual Port Multichannel T1 Net Module (ASN)
- 120-ohm Single Port MCE1-II Net Module (BLN and BCN)
- 120-ohm Single or Dual Port MCE1-II Link Module (ASN)
- QMCT1 Link Module (BLN and BCN)

To configure PRI lines:

1. **Begin at the Configuration Manager window (refer to Figure 1-1).**
2. **Click on an MCT1 or MCE1 connector.**

   Site Manager displays the Port Application window, which is similar to the window shown in Figure 1-8.
3. **Select PRI for the Port Application Mode and click on OK.**

Site Manager: Port Application Mode parameter: page A-16

Site Manager displays the Clock Parameters window (Figure 1-9).

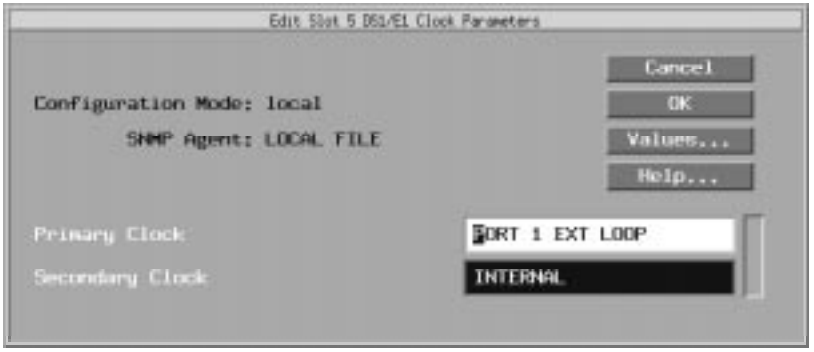


Figure 1-9. Clock Parameters Window

The clock parameters define the timing sources that apply to all connectors and DS0 timeslots supported by the MCT1 and MCE1 Link Modules.

4. **Click on OK to accept the default values for the clock parameters.**

   Site Manager displays the MCT1 Port Parameters window (Figure 1-10). The MCE1 Port Parameters window has different parameters.

   The port parameters apply to each of the 24 DS0 channels for MCT1 ports or 31 DS0 channels for MCE1 ports.

Figure 1-10. MCT1 Port Parameters Window

5. **Click on OK to accept the default values for the port parameters.**

Note: In most cases, you can use the defaults for MCT1 and MCE1 parameters. If you want to modify these values, refer to *Configuring WAN Line Services*.

Site Manager displays the PRI Logical Lines window (Figure 1-11).

Figure 1-11. PRI Logical Lines Window

For the first PRI interface you configure, the Timeslots window (Figure 1-12) appears immediately after the PRI Logical Lines window.

Figure 1-12 shows the MCT1 Timeslots window. The MCE1 Timeslots window is similar, but has 31 timeslots.

Figure 1-12. MCT1 Timeslots Window

Each PRI port supports up to 23 logical B channels for MCT1 ports or 30 logical B channels for MCE1 ports.

6. **Click on Select All to change all timeslots to B channels.**

   If you purchased selective PRI service from your ISDN provider, you can select individual timeslots. Select only the timeslots that the service provider assigns to you. For example, if your provider assigns you timeslots 1 through 10, select slots 1 through 10 in the Timeslots window.

   When you select a timeslot, a menu appears with two options (Figure 1-13).

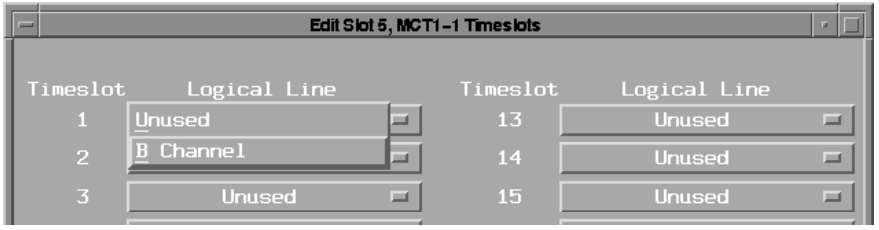


Figure 1-13. Menu for PRI Timeslot

Select B Channel from the menu. The configured timeslot should read **B channel**. Repeat the procedure for each timeslot you want to configure.

7. **Click on OK.**

   You return to the PRI Logical Lines window.

8. **Accept the default MTU size.**

9. **Click on Done.**

Adding ISDN Lines to a Pool

To add ISDN BRI or PRI lines to a pool:

1. **Begin at the Configuration Manager window (refer to Figure 1-1).**

2. **Select Dialup > Demand Pools, Backup Pools, or Bandwidth On Demand Pools.**

   Site Manager displays a Pools window similar to Figure 1-2 on page 1-6.

3. **Click on Add.**

   Site Manager displays the Pool Configuration window (refer to Figure 1-3 on page 1-6).

4. **Enter a pool ID and click on OK.**

Site Manager: Demand/Backup/Bandwidth Pool ID parameter: page A-4

   Site Manager displays the Lines Definition window (refer to Figure 1-4).

5. **Click on a previously configured ISDN, MCT1, or MCE1 port.**

   Site Manager displays the ISDN Switch Configuration window (Figure 1-14).

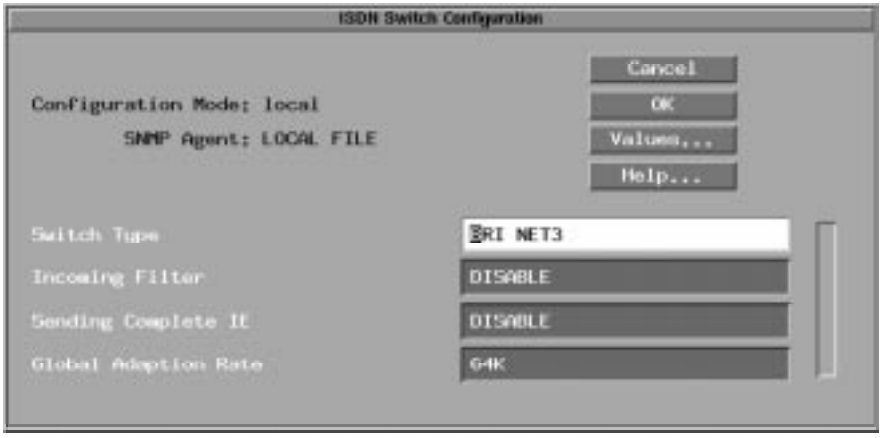


Figure 1-14. ISDN Switch Configuration Window

6. Accept the default switch or select another switch for your network.

Site Manager: Switch Type parameter: page A-16

7. Accept the defaults for the other parameters and click on Done.

Site Manager bypasses the ISDN Switch Configuration window for subsequent ISDN lines. Subsequent chapters explain how to modify the switch type.

After you select a switch, Site Manager displays the ISDN Logical Lines window (Figure 1-15), where you define the number of B channels in the pool and prioritize each channel.

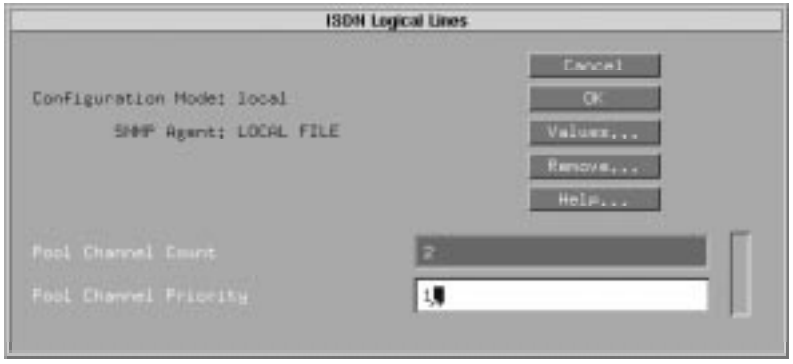


Figure 1-15. ISDN Logical Lines Window

Figure 1-15 shows the ISDN Logical Lines window for BRI. For PRI, the window is similar, but the parameter defaults are different.

8. **Accept the defaults by clicking on OK.**

   You return to the Lines Definition window (refer to Figure 1-4). To modify the other switch parameters, refer to Chapter 8.

9. **Select File > Exit to exit the Lines Definition window.**

   You return to the Pools window, which shows the configured pools. The window has three new buttons: Edit, Apply, and Delete.

10. **Repeat steps 1 through 9 to add more lines to the pool.**

    For backup and bandwidth services, you can select lines across slots.

11. **Go to the next section, "Configuring Circuits," to configure dial-up circuits.**

Configuring Circuits

To configure dial-up circuits, refer to the appropriate section for instructions:

- "Creating Demand Circuits"
- "Creating Backup Circuits," on page 1-25
- "Creating Bandwidth Circuits," on page 1-28

When you create a PPP dial-up circuit, Site Manager creates a special PPP record for the circuit, which identifies who is calling the router. This record is listed in the PPP Interface Lists window as follows:

```
Interface for Dialup Lines
```

For more information about PPP, refer to *Configuring PPP Services*.

Creating Demand Circuits

To configure Frame Relay demand circuits, skip this section and go to Chapter 9.

To configure PPP demand circuits:

1. **Begin at the Configuration Manager window (refer to Figure 1-1).**
2. **Select Dialup > Demand Circuits.**

   Site Manager displays the Demand Pools window, listing the new pools (Figure 1-16).

Figure 1-16. Demand Pools Window Listing Configured Pools

3. **Highlight the pool that you want the circuit to use and click on PPP Circuits.**

   Site Manager displays the PPP Demand Circuits window (Figure 1-17).

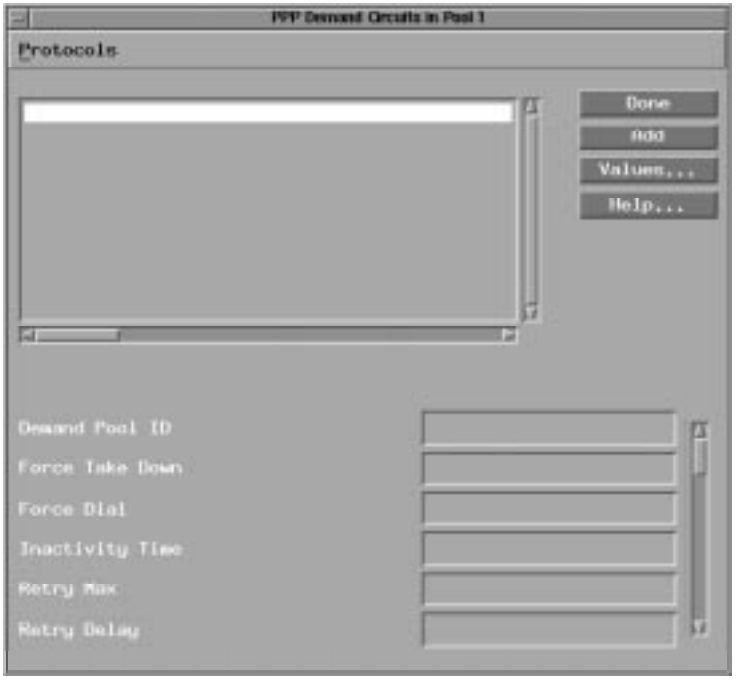


Figure 1-17. PPP Demand Circuits Window

4. **Click on Add to add a demand circuit.**

   You return to the PPP Demand Circuits window, which shows the new circuit and the defaults for each parameter (Figure 1-18). Site Manager also adds the following buttons: Apply, Schedule, Phone Out, BW on Demand, and Delete.

Figure 1-18. Completed PPP Demand Circuits Window

5. **Repeat step 4 for each demand circuit you want to add.**
6. **Keep the PPP Demand Circuits window open and go to the next section, "Specifying the Authentication Protocol Information."**

Specifying the Authentication Protocol Information

For network security, the router must identify itself in the call setup message that it sends to the remote router. The authentication protocols, CHAP and PAP, enable the identification process. CHAP is the default protocol.

All lines in a pool must use the same authentication protocol.

To specify the CHAP information that the router uses when it calls a remote site:

1. **Scroll down the PPP Demand Circuits window to the CHAP parameters.**
2. **Enter values for the CHAP Local Name and CHAP Secret parameters.**

   Each CHAP Local Name must be unique, but the CHAP Secret must be the same for both sides of the connection.

Site Manager: CHAP Local Name parameter: page A-37
Site Manager: CHAP Secret parameter: page A-38

3. **Go to the next section, "Specifying the Connection Mode."**

Specifying the Connection Mode

The connection mode determines which router places a call first, which prevents two routers from establishing a demand circuit with each other at the same time.

To configure the connection mode:

1. **Scroll down the PPP Demand Circuits window to the Connection Mode parameter.**
2. **Select a value for the Connection Mode parameter. Collision Master is the default.**

   If this router is set to Collision Master, we recommend that you set the router at the other side of the connection to Collision Slave.

Site Manager: Connection Mode parameter: page A-28

3. **Go to the next section, "Enabling a Protocol."**

Enabling a Protocol

In this section, you enable the Internet Protocol (IP). Refer to *Configuring IP Services* for Site Manager windows and parameter descriptions.

To enable one or more protocols for a selected demand circuit:

1. **From the top left corner of the PPP Demand Circuits window (refer to Figure 1-17), select Protocols > Add/Delete.**

   Site Manager displays the Select Protocols window (Figure 1-19).

Figure 1-19. Select Protocols Window

2. **Click on IP for this demand circuit and click on OK.**

   Site Manager displays the IP Configuration window.

3. **Enter an IP address and click on OK.**

Site Manager: IP Address parameter; see *Configuring IP Services*

   Site Manager displays the IP Adjacent Host Configuration window.

4. **Enter an IP adjacent host address and click on OK.**

Site Manager: IP Adjacent Host parameter; see *Configuring IP Services*

Site Manager displays the IP Adjacent Host Route window.

5. **Click on OK to accept the defaults.**

You return to the PPP Demand Circuits window (refer to Figure 1-18).

Note: You cannot configure protocol prioritization for demand circuits running PPP multilink. Protocol prioritization modifies the order in which packets are sent across the line. This could change the multilink-assigned order of packets and cause problems with the data.

6. **Do one of the following:**

   -- If you have ISDN lines in the pool, go to "Creating an Outgoing Phone List" on page 1-36.

   -- If you have only Raise DTR lines in the pool, click on Done in the PPP Demand Circuits window and go to "Setting Up the Caller Resolution Table" on page 1-40.

Creating Backup Circuits

To create a PPP backup circuit, you designate a single leased circuit, leased PPP multiline circuit, or leased multilink circuit as a *primary circuit*. If the primary circuit fails, the router activates a backup circuit to continue transmitting data.

To configure Frame Relay backup circuits, skip this section and go to Chapter 10.

To configure PPP backup circuits:

1. **Begin at the Configuration Manager window (refer to Figure 1-1).**
2. **Select Dialup > Backup Circuits > PPP.**

   Site Manager displays the Primary Circuit Definition window (Figure 1-20), which lists the leased circuits that you have configured.

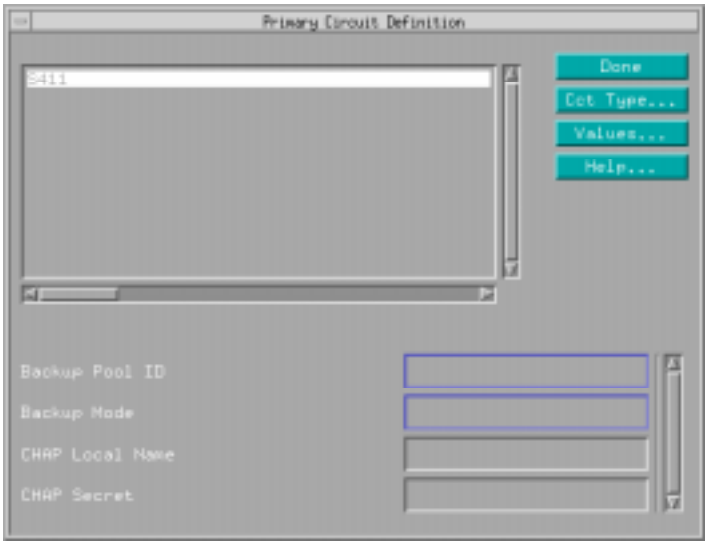


Figure 1-20. Primary Circuit Definition Window

3. **Highlight a circuit name and click on Cct (Circuit) Type.**

   Site Manager displays the Circuit Options window (Figure 1-21).

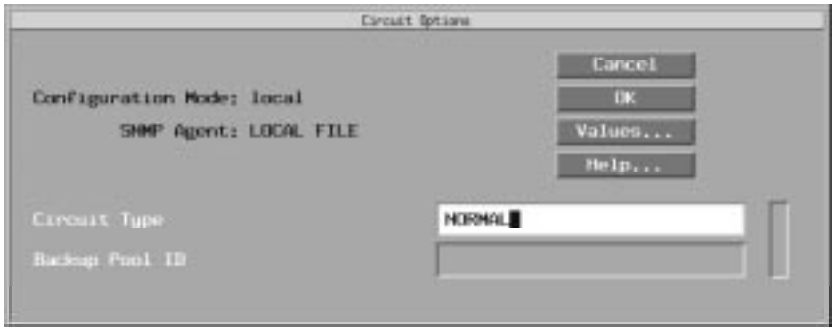


Figure 1-21. Circuit Options Window

4. **Select Primary for the Circuit Type parameter.**

Site Manager: Circuit Type parameter: page A-57

5. **Enter the ID of the backup pool that you want this circuit to use.**

Site Manager: Backup Pool ID parameter: page A-57

6. **Click on OK.**

   You return to the Primary Circuit Definition window, which shows the new circuit and the defaults for each parameter. Site Manager also adds the buttons Apply, Schedule, and Phone Out.

7. **Click on OK.**
8. **Repeat steps 2 through 6 to configure more primary circuits.**
9. **Keep the Primary Circuit Definition window open and go to the next section, "Specifying the Backup Mode."**

Specifying the Backup Mode

The backup mode determines which router initiates a backup connection. To specify the backup mode:

1. **Scroll down the Primary Circuit Definition window to the Backup Mode parameter.**
2. **Select a value for the Backup Mode parameter. Master is the default.**

   If this router is set to Master, the peer must be set to Slave.

Site Manager: Backup Mode parameter: page A-58

3. **Go to the next section, "Specifying the Authentication Protocol Information."**

Specifying the Authentication Protocol Information

For network security, the master router must identify itself when it calls the remote router. The authentication protocols, CHAP and PAP, enable the identification process. CHAP is the default protocol. All lines in a pool must use the same authentication protocol.

To specify the CHAP information for the local router, do the following:

1. **Scroll down the Primary Circuit Definition window to the CHAP parameters.**
2. **Enter values for the CHAP Local Name and CHAP Secret parameters.**

   The CHAP Local Name must be unique, but the CHAP Secret must be the same on both sides of the connection.

Site Manager: CHAP Local Name parameter: page A-37
Site Manager: CHAP Secret parameter: page A-38

3. **Do one of the following:**

   -- If you have ISDN lines in the pool, go to "Creating an Outgoing Phone List" on page 1-36.

   -- If you have only Raise DTR lines in the pool, click on Done and go to "Setting Up the Caller Resolution Table" on page 1-40.

Creating Bandwidth Circuits

There are two ways to enable bandwidth-on-demand service: designate a single leased circuit or a leased multilink circuit as a *bandwidth-on-demand* circuit, or assign a bandwidth pool to a demand circuit. If these circuits become congested, the router provides up to 29 dial-up circuits to relieve the congestion, for a total of 30 dial-up lines for communication.

For configuration instructions, refer to the next section for leased circuits or to "Adding Bandwidth Service for Demand Lines" on page 1-33.

Configuring Leased Circuits as Bandwidth Circuits

You should have already configured PPP multilink for the leased circuits that you will designate as bandwidth circuits.

To configure leased circuits as bandwidth circuits:

1. **Begin at the Configuration Manager window (refer to Figure 1-1).**
2. **Select Dialup > Bandwidth On Demand Circuits.**

   Site Manager displays the Bandwidth-On-Demand Circuit Definition window (Figure 1-22), which lists the leased circuits that you previously configured.

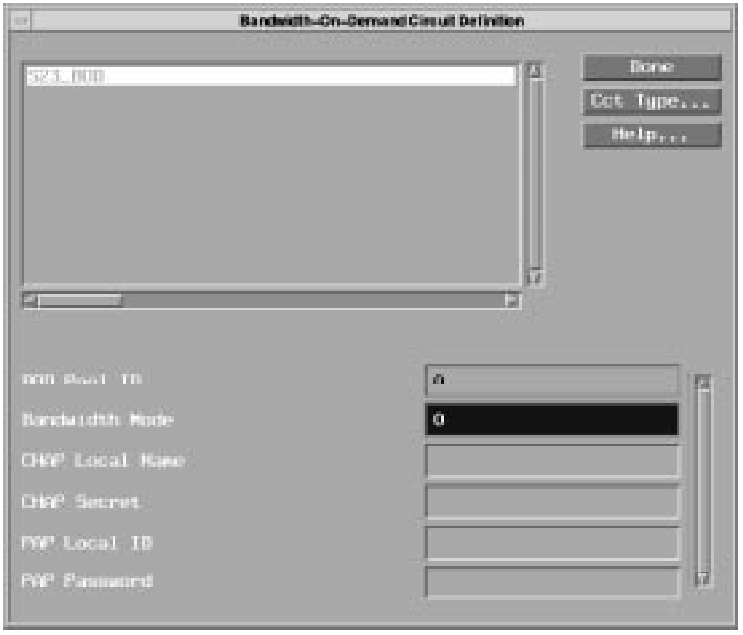


Figure 1-22. Bandwidth-on-Demand Circuit Definition Window

3. **Highlight a circuit and click on Cct Type.**

   Site Manager displays the Circuit Options window (Figure 1-23).

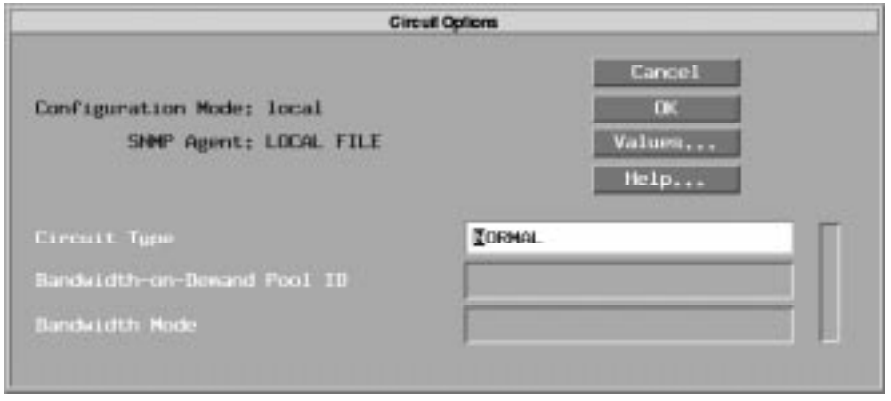


Figure 1-23. Circuit Options Window

4. **Select Bandwidth on Demand for the Circuit Type parameter.**

Site Manager: Circuit Type parameter: page A-77

5. **Enter the ID of the bandwidth pool you want this circuit to use.**

Site Manager: Bandwidth-on-Demand Pool ID parameter: page A-80

6. **Keep this window open and go to the next section, "Specifying the Bandwidth Mode."**

Specifying the Bandwidth Mode

The bandwidth mode determines whether the router serves as the congestion monitor. The level of congestion instructs the router when to provide additional circuits to carry data across the network.

To configure the bandwidth mode:

1. **Scroll down the Circuit Options window to see the Bandwidth Mode parameter.**
2. **Select a bandwidth mode. Non-Monitor is the default.**

   If this router is set to Non-Monitor, the peer must be set to Monitor.

Site Manager: Bandwidth Mode parameter: page A-78

   Note the following for the Bandwidth Mode parameter:

   - If you accepted the default, Non-Monitor:

     Site Manager displays the Caller Resolution Info window, which you use to enter the name of the remote router that this circuit supports. This enables the local, non-monitor router receiving the call to identify the remote router placing the call.

     Enter values for the Caller Name and CHAP Secret parameters, then click on OK.

Site Manager: Caller Name parameter: page A-102
Site Manager: CHAP Secret parameter: page A-102

- If you selected Monitor:

  Site Manager does not prompt you for caller resolution information. However, if this is the first monitor circuit associated with a pool that uses multiple slots, Site Manager displays the Preferred/Reserved Slots for BOD Pool window (Figure 1-24).

Figure 1-24. Preferred/Reserved Slots for BOD Pool Window

Enter a number for the Preferred Bandwidth Slot and Reserved Bandwidth Slot parameters and click on OK.

Site Manager: Preferred Bandwidth Slot parameter: page A-82
Site Manager: Reserved Bandwidth Slot parameter: page A-83

You return to the Circuit Options window (refer to Figure 1-23).

3. **Click on OK to exit the Circuit Options window.**

   You return to the Bandwidth-on-Demand Circuit Definition window (refer to Figure 1-22).

4. **Keep the Bandwidth-on-Demand Circuit Definition window open and go to the next section, "Specifying the Authentication Protocol."**

Specifying the Authentication Protocol

For network security, the router must identify itself in the call setup message that it sends to the remote router. The authentication protocols, CHAP and PAP, enable the identification process. CHAP is the default protocol.

All lines in a pool must use the same authentication protocol.

To specify the CHAP information for the local router:

1. **Scroll down the Bandwidth-on-Demand Circuit Definition window to the CHAP parameters.**
2. **Enter values for the CHAP Local Name and CHAP Secret parameters.**

   The CHAP Local Name must be unique, but the CHAP Secret must be the same on both sides of the connection.

Site Manager: CHAP Local Name parameter: page A-37
Site Manager: CHAP Secret parameter: page A-38

3. **Do one of the following:**

   -- If you have ISDN lines in the pool, go to "Creating an Outgoing Phone List" on page 1-36.

   -- If you have only Raise D TR lines in the pool, click on Done in the Bandwidth-on-Demand Circuit Definition window and go to "Setting Up the Caller Resolution Table" on page 1-40.

Adding Bandwidth Service for Demand Lines

If the demand line becomes congested, the router can provide 29 additional dial-up lines to reduce congestion. To do this, you enable bandwidth service for the demand line by associating it with a configured bandwidth pool.

To add bandwidth service for a demand circuit:

1. **Select Dialup > Demand Circuits > PPP Circuits.**

   Site Manager displays the PPP Demand Circuits window (Figure 1-25).

Figure 1-25. PPP Demand Circuits Window

2. **Click on BW on Demand.**

   Site Manager displays the Enter a BOD Pool window (Figure 1-26).

Figure 1-26. Enter a BOD Pool Window

3. **Enter the ID number of a configured bandwidth pool.**
4. **Click on OK.**

   Site Manager displays the BOD Configuration window (Figure 1-27). The parameters in this window determine whether the router acts as the *monitor router*, which means that it monitors congestion on the line, and whether the router activates additional lines to relieve congestion.

Figure 1-27. BOD Configuration Window

5. **Click on OK to accept the defaults.**

   You return to the PPP Demand Circuits window.

6. **Click on Remove BOD only if you want to remove bandwidth service for the demand circuit; otherwise, go to the next step.**

7. **Do one of the following:**

   -- If you have ISDN lines in the pool, go to "Creating an Outgoing Phone List" on page 1-36.

   -- If you have only Raise DTR lines in the pool, click on Done and go to "Setting Up the Caller Resolution Table" on page 1-40.

Creating an Outgoing Phone List

For ISDN, V.25bis, and Hayes connections, the router uses the outgoing phone list to place a call to a remote router. In this chapter, we assume that your modem connections are Raise DTR, which means that the phone numbers are programmed directly into the modem. Therefore, you only need to set up an outgoing phone list if you have configured ISDN connections.

Outgoing phone lists are associated with a specific circuit, not with the physical line. The lines in the pool may be used by many circuits, which is why the telephone numbers are part of each circuit's configuration and not the line's configuration.

To create an outgoing phone list:

1. **Begin at the PPP Demand Circuits, Primary Circuit Definition, or Bandwidth-on-Demand Circuit Definition window.**
2. **Select a circuit and click on Phone Out.**

   Site Manager displays the Outgoing Phone List window (Figure 1-28).

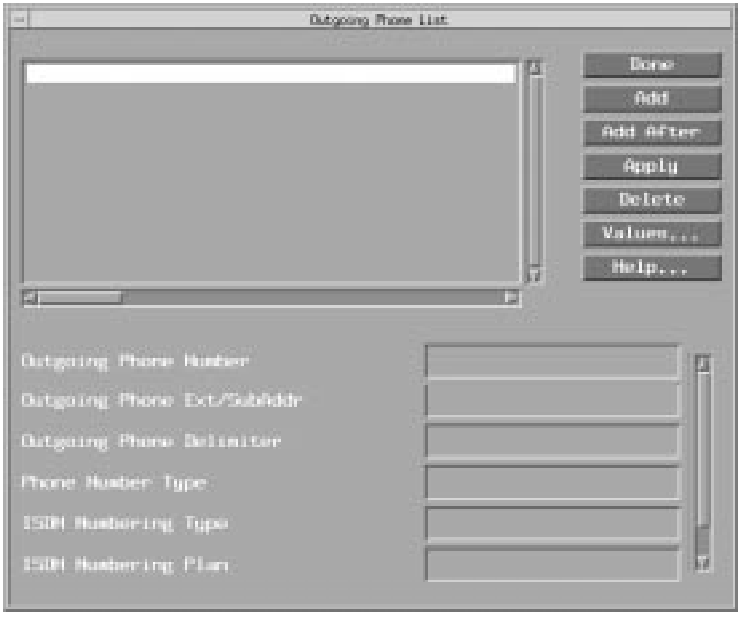


Figure 1-28. Outgoing Phone List Window

3. **Click on Add to display the Phone Number window (Figure 1-29).**

Figure 1-29. Phone Number Window

4. **Enter a phone number for the Phone Number parameter, and an extension, if any, for the Phone Ext/Subaddr parameter.**

Site Manager: Outgoing Phone Number parameter: page A-90
Site Manager: Outgoing Phone Ext/SubAddr parameter: page A-91

5. **Click on OK.**

   You return to the Outgoing Phone List window with the phone number parameters and the phone list filled in.

6. **Accept the defaults for Phone Number Type, ISDN Numbering Type, and ISDN Numbering Plan, unless your service provider instructs otherwise.**

Site Manager: Outgoing Phone Number Type parameter: page A-93
Site Manager: ISDN Numbering Type parameter: page A-94
Site Manager: ISDN Numbering Plan parameter: page A-94

7. **Click on Done when you finish entering phone numbers.**

8. **For ISDN configurations, go to the next section; otherwise, go to "Setting Up the Caller Resolution Table" on page 1-40.**

Creating the Local Phone List (ISDN only)

A local phone number identifies the local router when it places a call to a remote router. The router includes its own phone number in the ISDN outgoing call setup message. This number, along with Service Provider IDs (SPIDs) in the United States and Canada, also identifies the router to the ISDN switch so that the switch can activate the circuit. Your ISDN service provider assigns this number.

You must configure local phone numbers if you use the Bandwidth Allocation Protocol (BAP) with bandwidth service across ISDN connections. The router designated as the non-monitor uses the local phone number to identify additional lines to the peer.

To create a local phone list:

1. **Begin at the Configuration Manager window (refer to Figure 1-1).**
2. **Select Dialup > Local Phone Numbers.**

   Site Manager displays the ISDN Local Phone Lines window (Figure 1-30).

Figure 1-30. ISDN Local Phone Lines Window

3. **Click on Local Phones.**

   Site Manager displays the ISDN Local Phone Numbers window (Figure 1-31).

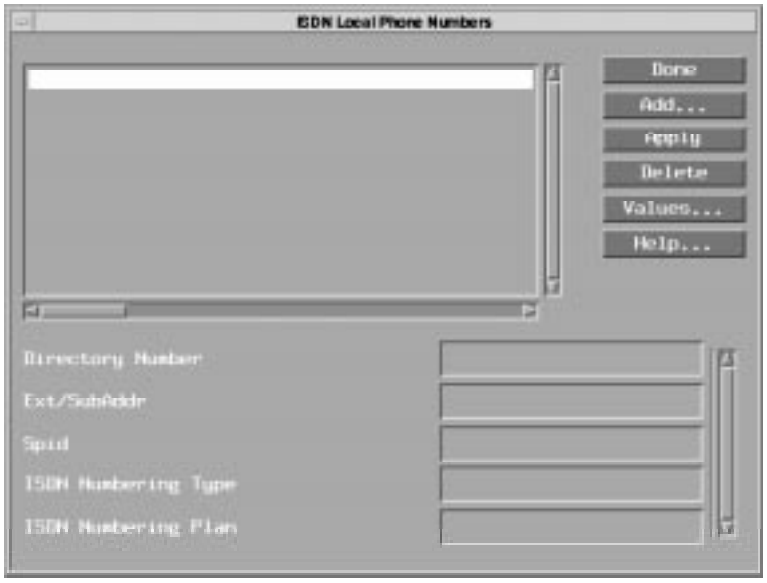


Figure 1-31. ISDN Local Phone Numbers Window

The SPID parameter appears only for switches used in the United States and Canada.

4. **Click on Add.**

Site Manager displays the Phone Number window (Figure 1-32).

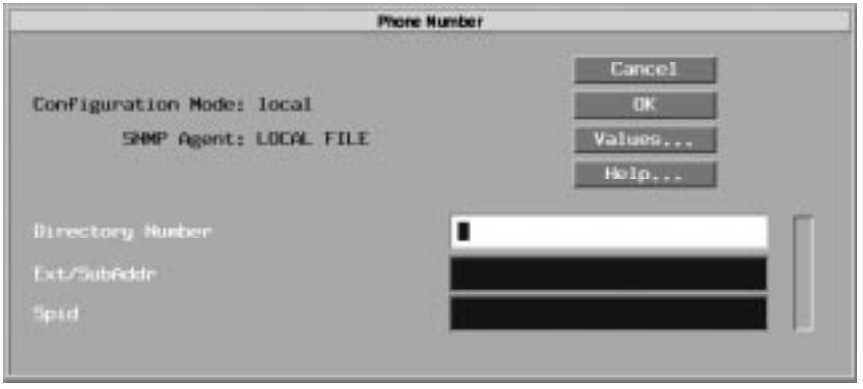


Figure 1-32. Phone Number Window

5. **Enter a local phone number and a subaddress, if any.**

Site Manager: Directory Number parameter: page A-87
Site Manager: Ext/SubAddr parameter: page A-87

6. **Click on OK to accept the defaults for the other parameters.**

   You return to the ISDN Local Phone Numbers window, which shows the new phone entry.

7. **Repeat the procedure for each phone number you want to add.**
8. **Click on Done until you return to the Configuration Manager window.**
9. **Go to the next section, "Setting Up the Caller Resolution Table."**

Setting Up the Caller Resolution Table

For network security, all three dial services use a PPP identification mechanism to determine who is calling the router. PPP performs this identification process using one of two authentication protocols, CHAP or PAP. CHAP is the default protocol.

To identify an incoming remote caller, you enter the name and CHAP secret of each remote caller in a *caller resolution table*, and associate each name with a local demand, primary, or bandwidth circuit. When a router receives an incoming call, it checks the caller resolution table for an entry that identifies the caller. If the caller is authorized, the local router activates a circuit.

To configure the caller resolution table:

1. **Begin at the Configuration Manager window (refer to Figure 1-1).**
2. **Select Dialup > Caller Resolution Table.**

   Site Manager displays the Caller Resolution Table window (Figure 1-33).

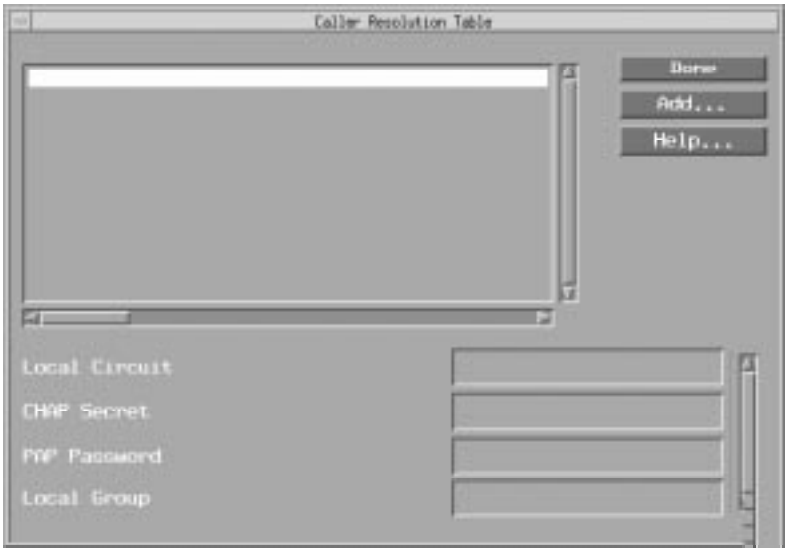


Figure 1-33. Caller Resolution Table Window

3. **Click on Add to add an entry to the table.**

   Site Manager displays the Caller Name and Secret/Password window (Figure 1-34).

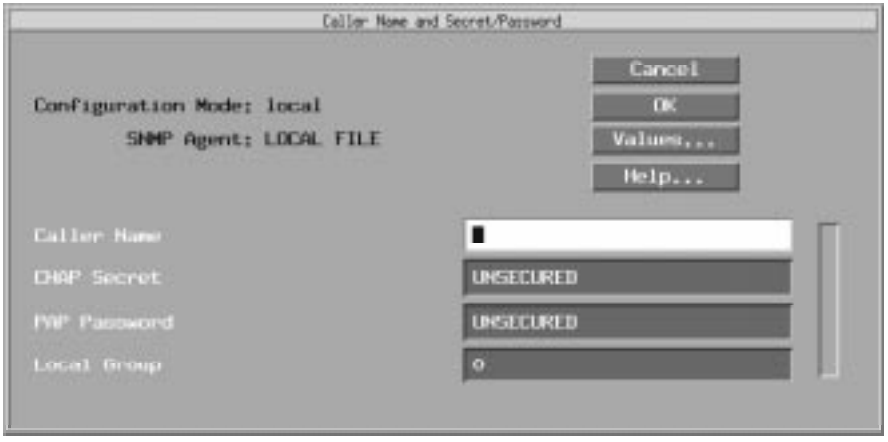


Figure 1-34. Caller Name and Secret/Password Window

4. **Enter the name and CHAP secret of the remote router.**

   The CHAP secret must be the same for routers on both sides of the circuit.

Site Manager: Caller Name parameter: page A-102
Site Manager: CHAP Secret parameter: page A-102

   The Caller Name parameter identifies a remote router. Do not confuse this parameter with the CHAP Local Name parameter, which identifies the local router, that is, the router you are currently configuring.

5. **Click on OK.**

   Site Manager displays the Local Circuit List window (Figure 1-35), which lists the demand, primary, or bandwidth circuits that you have configured.

Figure 1-35. Local Circuit List Window

6. **Highlight the local circuit that the router should activate when it receives a call from the remote router (specified in the Caller Name parameter).**

Site Manager: Local Circuit parameter: page A-103

7. **Click on OK.**

   You return to the caller resolution table window. When you select a caller name in the window, the parameters display the caller's information.

8. **Click on Done when you finish adding table entries.**

What to Do Next

Now that you have completed the steps in this chapter, your dial service should be operating. To further modify your configuration, refer to the appropriate chapter for instructions:

- Chapter 2 provides an overview of each service.
- Chapter 3 provides an overview of ISDN.
- Chapter 4 describes Bay Networks implementation common to all dial services.
- Chapters 5 through 7 describe Bay Networks implementation of dial-on-demand, dial backup, and bandwidth-on-demand, respectively. These chapters provide information to help you make appropriate customizing choices.
- Chapters 8 through 13 provide instructions for customizing your configuration.
- Appendix A contains parameter descriptions for all dial services.
- Appendix B provides some basic configuration examples.
- Appendix C lists parameter defaults for all dial services.
- Appendix D explains how to order ISDN lines in the United States.
- Appendix E lists the AT initialization commands for the ARN™.

Chapter 2
Dial Services Overview

A dial service provides access to a central switched network for remote users, such as people in branch offices, telecommuters, and sales people in the field. To make these remote connections, dial services use dial-up lines (also called *switched lines*), which are activated only when needed.

If you send a limited amount of data or your data transmission is intermittent, dial-up lines can be less expensive than leased lines, and they improve network performance and flexibility.

This chapter introduces Bay Networks dial services. Chapters 4 through 7 describe Bay Networks implementation of each dial service.

Bay Networks Dial Services

The router provides three types of dial services: dial-on-demand, dial backup, and bandwidth-on-demand. Each dial service serves a different purpose:

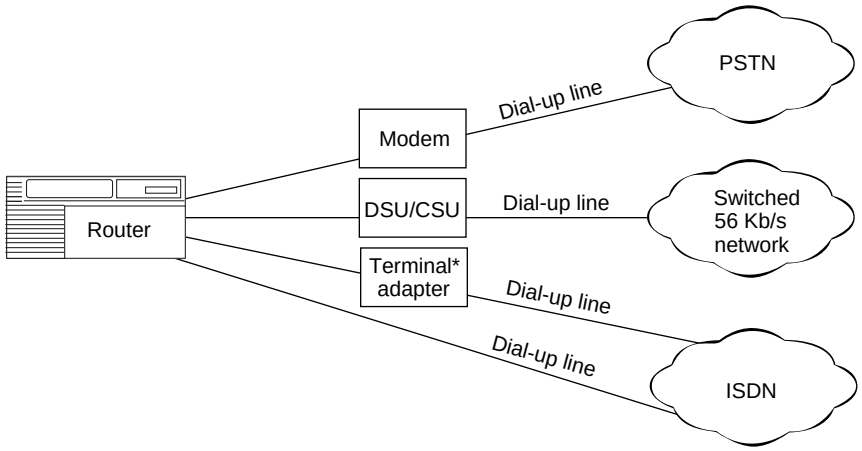
- **Dial-on-demand** service reduces your line costs by establishing a connection between two devices only when there is data to send. You do not incur the cost of a leased line that is active regardless of data traffic.
- **Dial backup** service provides a backup circuit when a leased circuit fails. The backup circuit serves as an alternative path for data to reach its destination.
- **Bandwidth-on-demand** service provides up to 29 additional lines for a congested leased line, dial-on-demand line, or leased multilink bundle. This provides a total of 30 lines for communication. The additional lines increase bandwidth for data traffic, improving communication and reducing network delays.

The names of the dial services are sometimes abbreviated in this manual. Table 2-1 lists the full and abbreviated names of each dial service.

Table 2-1. Dial Service Names

Full Name	Abbreviated Name
Dial-on-demand	Demand
Dial backup	Backup
Bandwidth-on-demand	Bandwidth

All three dial services work over Public, Switched Telephone Networks (PSTNs) such as a standard telephone network, a switched 56 Kb/s network, and an Integrated Services Digital Network (ISDN) (Figure 2-1).



*You only need a terminal adapter if your router does not have built-in ISDN capability. If your router has an ISDN/BRI module or an MCT1 or MCE1 link module installed, along with ISDN software, you can connect to an ISDN network directly.

DS0005A

Figure 2-1. Example of Dial Access to a Switched Telephone Network

Network Access Methods and Services

The router initiates, monitors, and terminates dial-up connections using a modem or ISDN terminal adapter that supports Raise DTR, V.25bis, or Hayes signaling, or a router with a built-in ISDN interface connected directly to an ISDN network. If the router has internal ISDN capability, you do not need external dial devices.

Note: For BRI service, you need a network terminator 1 (NT1) to connect to an ISDN network. With the exception of the ARN, the router's ISDN/BRI Module does not include an internal NT1, so you or your service provider must supply it.

All three dial services enable the router to access a switched network as follows:

- **Integrated ISDN capability** -- Provides a BRI or PRI for digital connectivity from the router to the destination device, replacing standard analog phone lines. Using signals on an ISDN line, the router instructs the network to set up a call to a particular destination. ISDN capability eliminates the need for dial devices such as modems, because you no longer need to convert digital signals to analog. An ISDN network also allows you to send data, voice, and video over the same digital line.
- **Raise DTR** -- A signaling method that enables access to the network by preprogramming the destination phone numbers into the dial device (modem or ISDN terminal adapter). Raise DTR signaling works with the following interfaces: X.21, V.35, RS-232, and RS-422.
- **V.25bis** -- A signaling method that enables access to the network by passing the destination phone numbers from the router to the dial device (modem or ISDN terminal adapter). This method lets the dial device support connections to multiple destinations. V.25bis signaling works with the following interfaces: X.21, V.35, RS-232, and RS-422.
- **Hayes** -- A signaling method that enables network access by passing the destination phone numbers from the router to the dial device (modem or ISDN terminal adapter). Using Hayes signaling, the router sends an AT initialization command to interact with the dial device. The ARN internal V.34 modem uses Hayes signaling. Hayes signaling works with RS-232 interfaces.

The method you choose depends on your application, network resources, and the type of network to which you are connecting. ISDN, a complex networking technology, is further explained in Chapter 3.

Dial-on-Demand Service

Dial-on-demand service enables you to establish a network connection only when the router has data to send across the network, or when you dynamically configure the router to establish a connection. By using dial-up lines, you significantly reduce the high costs associated with leased lines, which connect remote locations even if there is no data to transmit or receive.

To implement dial-on-demand, the router establishes a demand circuit (that is, the logical connection) over a physical line. The router establishes a demand circuit when

- The router has data to send across the circuit.
- You specify a time of day to activate the circuit.
- You enable the Force Dial parameter, which instructs the router to force a connection.

The router terminates the circuit when

- The configured inactivity time expires because the router is not sending or receiving data.
- You schedule a time of day to take the circuit down.
- You enable the Force Take Down parameter, which instructs the router to force the termination of a connection.

Refer to “Activating Demand Circuits” on page 2-9 for more information.

Dial-on-demand is supported on asynchronous (RS-449), synchronous (RS-449, V.35, RS-422, and X.21), and ISDN interfaces. Figure 2-2 shows a demand line connecting two routers. When the router has data to transmit or when you configure the router to bring up a demand circuit, the router instructs the dial device to establish a connection.

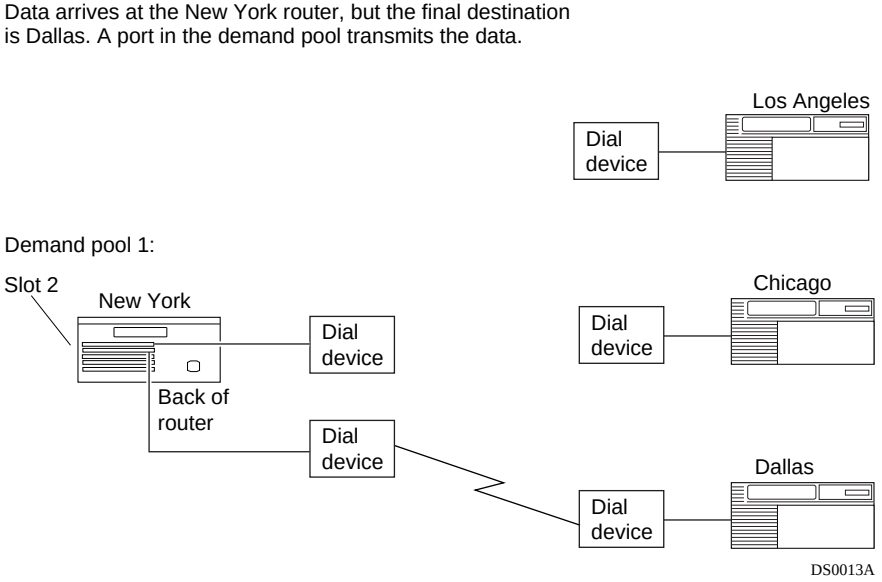


Figure 2-2. Dial-on-Demand Service

Demand Lines and Pools

Demand lines provide the physical connections over which the demand circuits transmit and receive data. To maximize the number of circuits that can be active simultaneously, you establish a *demand pool*.

A demand pool is a group of one or more lines that reside in the same slot on the router. You identify each demand pool by assigning a *demand pool ID*. Lines in a demand pool can connect to a modem, directly to a PSTN (using the ARN with the V.34 Modem Adapter Module), or directly to an ISDN network (using a router with internal ISDN capability).

You can combine asynchronous, synchronous, and ISDN interfaces in a single pool. The synchronous interfaces can use Raise DTR or V.25bis signaling for modem connections. The asynchronous interfaces can use Raise DTR, V.25bis, or Hayes signaling for modem connections. Hayes signaling requires that you use AT modem commands to send dialing instructions to the modem. The ISDN lines use ISDN signaling for network connections.

How Demand Lines, Pools, and Circuits Work Together

When you create demand circuits, you assign a demand pool ID to each circuit. Note that many demand circuits can use the same demand pool and, therefore, can use the same lines in that pool. The line itself does not have a specific network address; it is the circuit that has the associated network address.

When the router has data to send across a demand circuit, the circuit searches for an available demand line from its associated demand pool. When it finds an available line, the router establishes a dial-up connection to the remote router. The router terminates the connection when there is no more data to send or receive, when you manually take down the connection, or the scheduled time for an active connection expires.

Figure 2-3 shows the relationship between demand lines, pools, and circuits using PPP as the data link layer protocol.

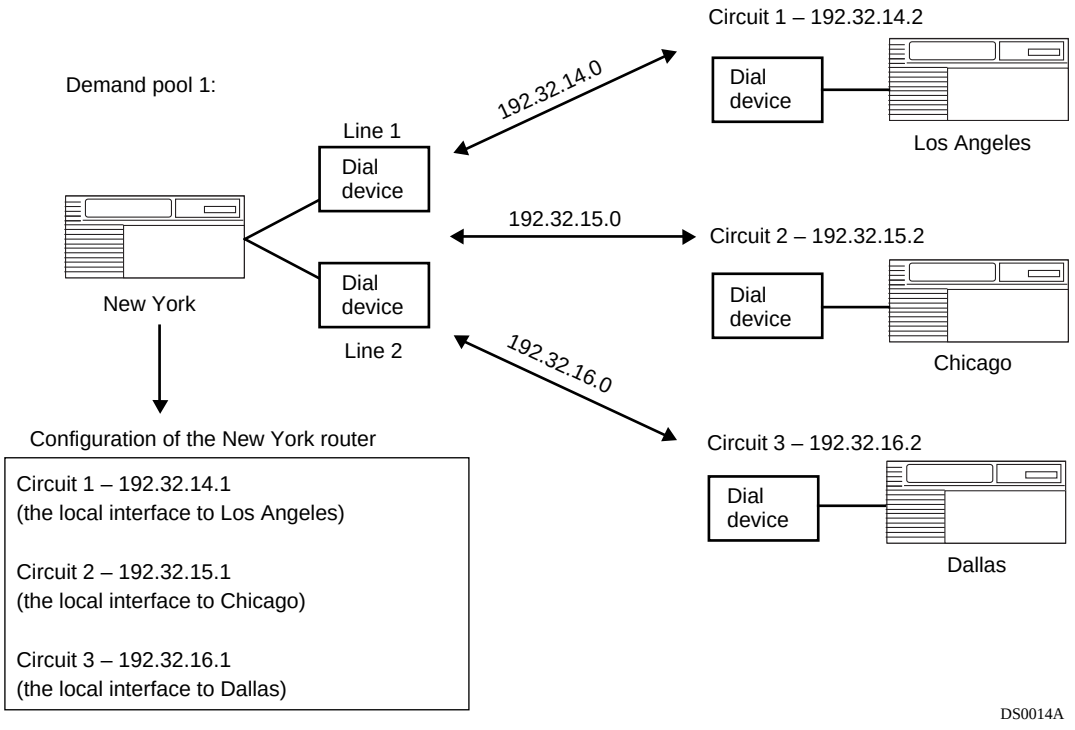


Figure 2-3. Example of Demand Lines, Pools, and Circuits

In Figure 2-3, three circuits share two physical lines that make up Demand pool 1. Note that only two of the circuits using Demand pool 1 can be active simultaneously because only two modems are available. The IP addresses are associated with each circuit, not with the physical line.

In addition to assigning a demand pool ID to each circuit, you can assign protocol interfaces and configure phone lists for use with V.25bis, Hayes, and ISDN signaling. Refer to Chapter 12 for more information.

Demand Circuit Protocols

The protocol for a demand circuit can be either PPP or Frame Relay. A Frame Relay demand circuit may have any number of service records and PVCs. Typically, Frame Relay connections are used with ISDN lines. PPP and Frame Relay circuits can use the same demand pool.

Figure 2-3 shows an example of a PPP demand circuit over modem lines. Figure 2-4 shows a Frame Relay demand circuit over ISDN lines.

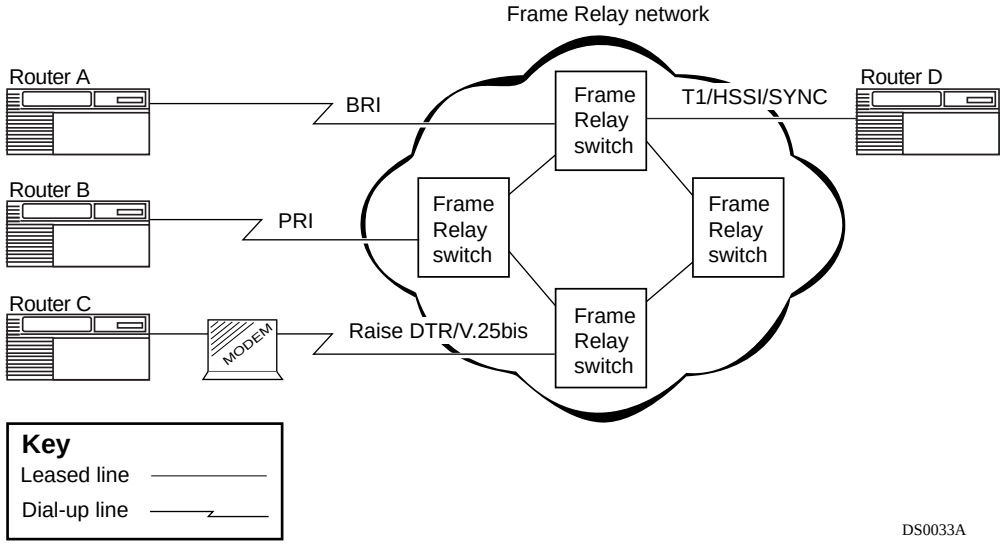


Figure 2-4. Dial-on-Demand Connection over a Frame Relay Network

In Figure 2-4, remote Routers A, B, and C are connecting to the central Router D through a Frame Relay network, dialing into the network across ISDN lines. Router D connects to the network across a leased line.

The permanent virtual circuits (PVCs) in this network can be either fully meshed or non-fully meshed, allowing Routers A, B, C, and D to connect to one another. With the dial connection between the routers and the Frame Relay network, each router can dial into the network and communicate with one another, provided that the PVCs are set up properly and the physical and logical connections are active.

Configuring Frame Relay to Work Optimally with Dial-on-Demand

How Frame Relay demand circuits operate depends on how your Frame Relay service provider defines the user network interface (UNI), the point between the router and the service provider. The service provider defines the UNI *dynamically* or *statically.*

If the UNI is dynamic, it changes for each call. This means that the PVCs may be different for each call, but they direct data to the same destination. The router initially learns the PVCs when it calls the Frame Relay switch. If the UNI is static, the user has defined the PVCs and can configure them for the router. The UNI remains the same for all calls.

For a Frame Relay demand configuration to work well, follow these guidelines:

- You must have a PVC configured *before* you place a call.

  For data to activate a demand circuit (instead of using Force Dial), the router must learn at least one PVC from the Frame Relay switch before it can place a call. However, to learn the PVCs, the router must call the switch, which it cannot do.

  For a dynamic UNI, you need to statically configure at least one PVC on the router that is not configured for the switch. The static PVC acts as a “fake” PVC that the router uses only to place an initial call to the switch. To configure a static PVC, you set the Frame Relay Data Link Connection Identifier (DLCI) to a number other than the number the switch provider assigns, assuming you know the range of possible DLCIs. The static PVC is still valid if you happen to use a number that the switch provider uses. Refer to *Configuring Frame Relay Services* for information about configuring PVCs.

  For a static UNI, the user configures the PVCs. A “fake” PVC is unnecessary.

- For a dynamic UNI, use the default Frame Relay service record. This service record holds all PVCs that the router learns dynamically.
- Choose a network layer protocol that can retransmit data between the PVC and the network if the data is lost.

  Although the router makes a dial connection and starts sending data, the PVCs do not always activate immediately. Consequently, you might lose data during the first part of the transmission. Therefore, it is important to use protocols that can account for this situation and ensure that any lost data can be sent again. We strongly recommend using Internet Protocol (IP) or Internet Protocol Exchange (IPX).
- If the remote routers in your network are using IP, ensure that they also use the Address Resolution Protocol (ARP) and not Inverse ARP. This enables the local router to learn address information.

Activating Demand Circuits

The router activates a demand circuit when

- The router has data to send across the circuit.

  When the router has data to transmit, it automatically selects one of the demand lines from the circuit's associated demand pool. As long as data is going across the line, the end-to-end connection remains active.
- You enable the Force Dial parameter.

  To activate a line immediately, you configure the Force Dial parameter to force the router to initiate a connection, regardless of whether there is data activity. To configure this parameter, refer to Chapter 9.
- You specify a time of day to activate the circuit.

  Using the Schedule option, you can schedule the circuit's availability for a specific day and time. The schedule parameters are part of the circuit's configuration (refer to Chapter 9). The Schedule option also allows you to specify whether the router uses the Inactivity Time parameter to dynamically deactivate the connection.

The router does not accept incoming calls or activate Frame Relay demand circuits if there is an incoming call from the Frame Relay network. The router answers an incoming call only over a PPP circuit.

The Frame Relay switch does not activate PVCs and configured DLCIs until the router receives data from the demand circuit and exchanges Data Link Control Management Interface (DLCMI) status messages with the switch. For more information about Frame Relay, refer to *Configuring Frame Relay Services*.

Terminating Demand Circuits

The router deactivates the demand circuit when

- You enable the Force Take Down parameter.

  To deactivate a force dial connection, you configure the Force Take Down parameter, which instructs the router to clear the connection. To learn how to configure this parameter, refer to Chapter 9.

- You schedule the circuit to come down.

  Using the Schedule option, you can schedule the circuit's availability for a specific day and time. The schedule parameters are part of the circuit's configuration (refer to Chapter 9). The Schedule option also allows you to configure whether the router uses the Inactivity Time parameter to dynamically deactivate the connection.

- The inactivity time expires.

  To deactivate the connection, you can configure the Inactivity Time parameter, which dynamically terminates the connection after a specified amount of time elapses without data activity. If there is data going across the line, the inactivity time resets and the connection remains active.

  To ensure that a connection is not up longer than necessary, you can configure traffic filters that allow specific types of data to go across a line without resetting the inactivity time.

  For PPP connections, the router does not consider Link Quality Report (LQR), Link Control Protocol (LCP), and periodic CHAP messages as data, so these messages do not reset the inactivity timer.

  For Frame Relay circuits, DLCMI messages and other signaling packets are not treated as data, so they do not reset the inactivity timer. The router usually terminates Frame Relay demand connections, not the Frame Relay network.

- The Frame Relay DLCMI fails.

  If the DLCMI messages cannot be exchanged across the Frame Relay demand circuit, the router deactivates the circuit.

Bandwidth-on-Demand Service for Congested Demand Lines

To relieve congestion across a demand line, you can use up to 29 additional lines from an existing bandwidth-on-demand pool, providing a total of 30 lines for communication. This feature is only for demand configurations that use PPP as the data link-layer protocol. Adding bandwidth to a congested demand line benefits time-critical applications that require data to reach its destination efficiently.

To enable bandwidth-on-demand service, you associate the demand circuit with a bandwidth-on-demand pool, then you configure parameters that monitor congestion across the line.

Once you enable bandwidth-on-demand service, the router determines that the demand line is congested when the traffic over the line exceeds a certain user-configured threshold. The router that is configured as the congestion monitor then searches for an available line from the bandwidth pool that you associate with this demand circuit.

Lines in a bandwidth-on-demand pool can reside across slots, so you need to designate each slot as either *preferred* or *reserved*. This determines the order in which the router searches the slots for available lines; the preferred slot is first and the reserved slot is second. If these slots have no available lines, the router automatically uses the *local* slot. The local slot is the slot containing the first demand line that was activated. When the router activates additional lines, they adopt the configuration of the congested demand circuit.

PPP multilink is the protocol that enables the router to use multiple lines simultaneously to transmit data. Multilink enables the router to use lines at different speeds and to evenly distribute data across those lines. When you enable multilink, you can configure a set of links between two peers into a single *bundle*. The actual number of lines in a multilink bundle depends on hardware platform constraints, total bundle speed, the speed of each link in the bundle, and the type of traffic you are sending.

For PPP demand connections across ISDN lines, you can manage the allocation of bandwidth for a multilink bundle by enabling the PPP Bandwidth Allocation Protocol (BAP). This protocol is available only after bandwidth service is set up. For more information about BAP, refer to Chapter 7.

Figure 2-5 illustrates how additional switched lines provide more bandwidth for a congested demand line.

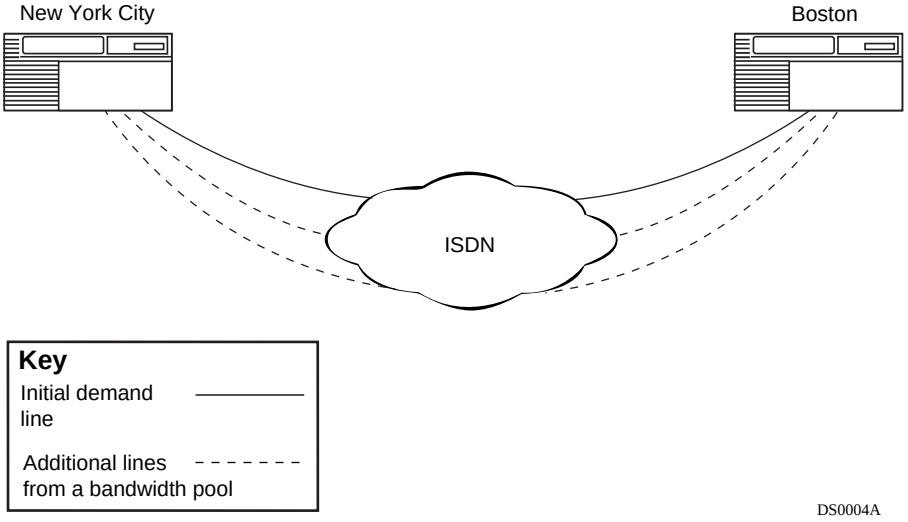


Figure 2-5. Additional Lines for a Dial-on-Demand Connection

Dial Backup Service

Dial backup service lets you configure backup lines for failed primary lines. A *primary line* is a leased line, a leased multiline (Standard and PPP only), or a leased multilink connection. This leased line acts as the physical connection over which the leased circuit (the logical connection) carries traffic. You designate these leased circuits as *primary circuits*, which instructs the router to provide backup service if the primary line and circuit fail.

If a primary circuit fails and you configure dial backup service for that circuit, the router activates an available backup line. When the primary circuit is restored, the router reroutes all traffic from the backup circuit to the primary circuit and clears the dial backup connection.

Dial backup is supported on asynchronous lines (RS-449), synchronous lines (RS-449, V.35, RS-422, and X.21), and ISDN interfaces.

Table 2-2 lists the primary and backup lines you can configure.

Table 2-2. Primary and Backup Lines

Line	Type
Primary	Any leased line up to T1/E1 rates, including multiline (Standard and PPP only) and multilink connections. Frame Relay multiline circuits cannot be dial backup primaries.
	Frame Relay PVCs
Backup	Any WAN line including ISDN B channels. Lines must be in the dial backup pool.

Table 2-3 lists the protocols for each type of primary and backup circuit.

Table 2-3. Primary and Backup Circuit Protocols

If the primary circuit's protocol is	The backup circuit's protocol can be
Standard	Async or Sync PPP only
PPP	Async or Sync PPP only
Frame Relay -- backing up only one PVC	Async or Sync PPP only
Frame Relay -- backing up the entire Frame Relay interface	Frame Relay only

Circuit Backup versus Link Backup

When you select PPP or Frame Relay for the backup circuit, you determine whether the router performs *circuit backup* or *link backup*.

Circuit backup is a point-to-point backup connection. One circuit is backed up at a time, instead of an entire interface. When you back up a point-to-point primary circuit (Standard, PPP, or a single Frame Relay PVC), the protocol for the backup circuit is PPP.

Figures 2-6 and 2-7 show examples of circuit backup. Figure 2-6 shows a Standard primary circuit aided by a PPP backup circuit. Figure 2-7 shows a PPP primary circuit aided by a PPP backup circuit.

Note: For circuit backup of a single Frame Relay PVC, the backup line passes through the switched network only, bypassing the Frame Relay network.

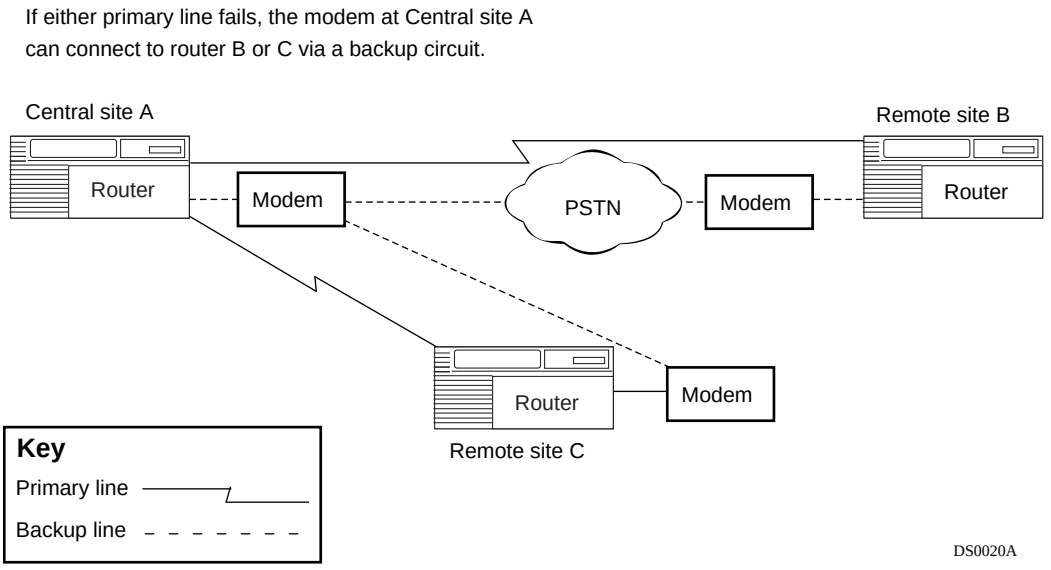


Figure 2-6. PPP Backup over a PSTN

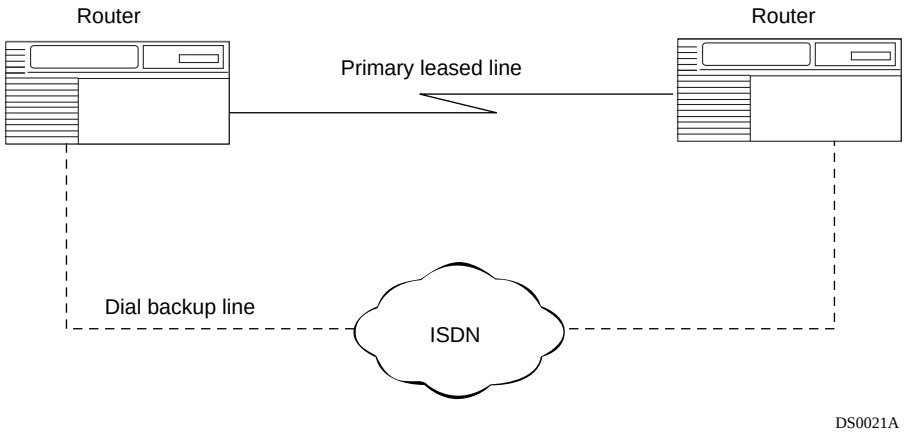


Figure 2-7. PPP Backup over an ISDN Network

Link backup is a multiple-circuit backup, which means that the entire interface is backed up. To back up all PVCs for a Frame Relay interface, you configure Frame Relay across the backup circuit.

Figure 2-8 shows an example of link backup.

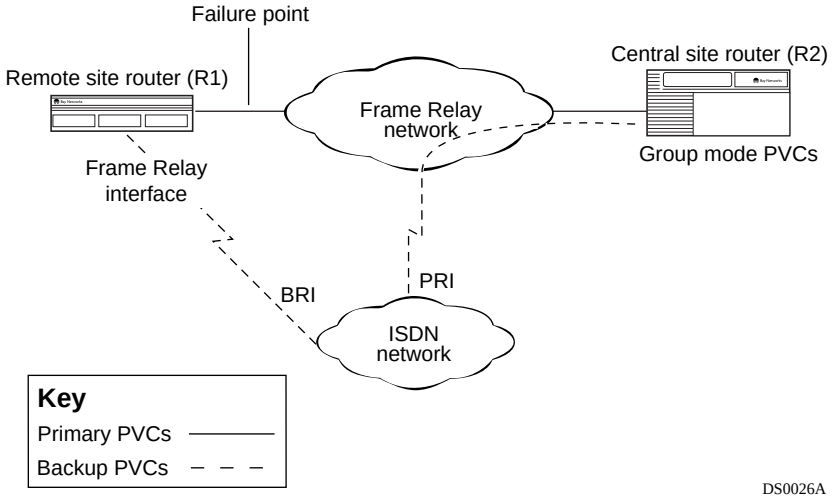


Figure 2-8. Link Backup for a Frame Relay Network

In Figure 2-8, if the Frame Relay link fails at router R1, the router activates a backup connection through the ISDN network, then back through the Frame Relay network to the destination. The backup connection to the Frame Relay network uses a different network interface and PVCs than the primary connection. Once the primary line recovers and the Frame Relay switch responds to router R1's DLCMI status requests, router R1 terminates the backup connection.

Note: A primary circuit cannot use link and circuit backup simultaneously.

Knowing When the Primary Line Fails

Depending on the protocol for the primary and backup circuit, the router determines that the primary circuit failed in one of the following ways:

- No Breath of Life (BofL) messages in the BofL time period (Standard and PPP)

  For Standard and PPP, Site Manager automatically enables BofL messages on each primary line and disables them on each backup line. BofL messages verify that the line is operational. The router determines that the primary line has failed when it stops receiving packets within the BofL time period.

  You configure the BofL timer using the synchronous line parameter BofL Timeout. See *Configuring WAN Line Services* for more information.

- No DLCMI messages (Frame Relay primary/Frame Relay backup)

  When Frame Relay is the protocol for the backup circuit, the router performs link backup. For link backup, the router knows that the primary failed when it no longer receives DLCMI messages from the switch. These messages communicate information about the interface and the status of each PVC.

  The router may also rely on modem signals to determine if the primary circuit failed. If you rely on modem signals, you must set the Sync Polling parameter to Enable, which instructs the router to monitor modem signals. (Refer to *Configuring WAN Line Services* for more information about the Sync Polling parameter.) In addition, you must use the proper synchronous cable to connect to the primary line's modem or CSU/DSU. Refer to the *Cable Guide for Routers and BayStream Platforms*.

- A-bit notification (Single Frame Relay PVC primary/PPP backup)

  If only one Frame Relay PVC is being backed up by PPP, the router performs circuit backup. For circuit backup, the Frame Relay service provider must support A-bit notification, which tells the router the status of the PVC. This enables the router to back up the PVC if it fails. Without A-bit notification, the remote side of the PVC is never notified when the local side of the PVC has terminated, making dial backup service impossible.

Backup Lines and Pools

A backup line is an alternate line that carries data if the primary line fails. It is advantageous, therefore, to have one or more backup lines to ensure data transmission. To assign one or more backup lines to a primary line, you establish a *backup pool*.

A backup pool is a collection of lines that the primary circuits can use. Each backup pool is identified by a *backup pool ID*.

The lines in a backup pool can reside in any slot on the router that supports WAN lines; therefore, the pool can span multiple slots. Lines in a backup pool can connect to a modem, directly to a PSTN (using the ARN with the V.34 Modem Adapter Module), or directly to an ISDN network (using a router with integral ISDN capability).

You can combine asynchronous, synchronous, and ISDN interfaces in a single pool. The synchronous interfaces can use Raise DTR or V.25bis signaling for modem connections. The asynchronous interfaces can use Raise DTR, V.25bis, or Hayes signaling for modem connections. Hayes signaling requires that you use AT modem commands to send dialing instructions to the modem. The ISDN lines use ISDN signaling for network connections.

How Backup Lines, Pools, and Circuits Work Together

For each leased circuit that needs a backup circuit, you designate that circuit as a *primary circuit* and assign it a backup pool ID. If the primary circuit fails, the router activates the backup line to carry the backup circuit. If your network uses a multiline or multilink primary, the backup line is activated when the last line in the multiline or multilink bundle fails. You must first configure a leased circuit and a backup pool before you can configure primary and backup circuits.

Figure 2-9 shows how backup lines, pools, and circuits work together. The router in San Diego has two leased lines, one going to a router in Phoenix and the other to a router in San Francisco. The circuits for each of these destinations are associated with Backup Pool 1. If either of these leased lines fails, the San Diego router activates Backup Line 1 from Backup Pool 1 to continue routing traffic to the destination.

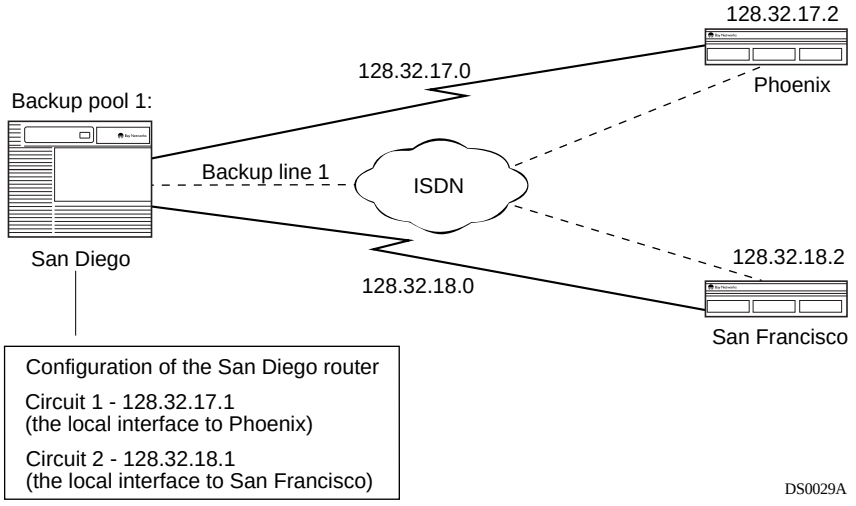


Figure 2-9. Example of Backup Pools, Lines, and Circuits

You can assign the same backup pool ID to more than one primary circuit. If you want only one backup line dedicated to a primary circuit, then you should configure only one line in a pool and assign that pool exclusively to that circuit.

Configuration of the Backup Circuit

The configuration of the backup circuit depends on the protocol for that circuit. If Standard or PPP is running over the primary circuit, the backup circuit inherits the primary's network layer address configuration. Unlike the network layer address configuration, the data link layer configuration can be unique.

If Frame Relay is running over the primary circuit, the backup circuit can inherit the primary's configuration or it can use its own configuration. When the Frame Relay primary and backup circuit use the same configuration, it is called the *shared configuration*. The shared configuration allows a backup circuit to use the same network layer address as the primary circuit. The backup circuit's data link layer configuration (PVCs, DLCIs, and filters) can be the same or different from the primary circuit.

If the backup circuit uses a unique configuration, it is called the *secondary configuration*. A secondary configuration uses a different network layer address, and data link layer configuration (PVCs and filters) from the primary circuit.

Note: If the backup circuit connects to a different interface at the destination than the primary circuit, you do not need to configure unique PVCs for the backup circuit. In this case, the switch informs the destination router of the available PVCs.

Activating the Backup Line

When the router detects a failure on the primary line, it selects a line from a backup pool. The router activates a backup line when

- The primary circuit is not operating.
- All of the primary circuit's lines have failed.
- An active backup line has failed.

  If the backup line itself fails, an inactive backup line can replace it only if you configure multiple lines in the backup pool. If the first line fails for every phone number in the router's phone list, and the primary line is still down, the router tries the next line in the pool.

  If you are backing up a Frame Relay primary circuit, the router (not the network) activates and terminates the Frame Relay backup connection. The router rejects incoming calls from the Frame Relay network.

Reestablishing the Backup Connection

If the remote site has several telephone lines attached to individual dial units, the backup circuit uses the telephone numbers stored in the primary circuit's record to connect to the site. If one telephone number fails, the backup line attempts to connect using one of the other telephone numbers.

For V.25bis calls, the router redials the same phone number until its retry attempts reach the maximum retry count that you specify in the modem parameters. If the router cannot make a connection using the current phone number, it tries the next number in its phone list. It continues trying until it has gone through all of the numbers or it connects successfully.

For ISDN calls, the router sends a call setup message for each number in the phone list. If the router cannot make a connection using the current phone number, it tries the next number in its phone list. It continues trying until it has gone through all of the numbers or it connects successfully.

Terminating the Backup Connection

The router terminates the backup circuit once it restores the primary circuit, the backup circuit fails, or the configured time period for the backup circuit has expired. Once the router restores the primary circuit, it verifies that the backup circuit is no longer active. If the backup is still active, the router terminates it.

Bandwidth-on-Demand Service

Bandwidth-on-demand service lets you configure additional dial-up lines for

- A congested leased line
- A congested multilink bundle, which is a set of links between two peer routers
- A congested dial-on-demand line

Note: Refer to "Bandwidth-on-Demand Service for Congested Demand Lines" on page 2-11 for information about adding bandwidth for demand lines.

When data traffic exceeds the capacity of a line or bundle, bandwidth-on-demand service reduces congestion by adding up to 29 dial-up lines. The router can then provide a total of 30 lines for communication.

PPP multilink is the protocol that enables the router to use multiple dial-up lines simultaneously to transmit data. The actual number of lines in a multilink bundle depends on hardware platform constraints, total speed of the bundle, the speed of each link, and the type of traffic you are sending.

You can manage the allocation of bandwidth for a multilink bundle using the PPP BAP. This protocol is available only for ISDN lines; you configure it after you configure bandwidth-on-demand service. For more information about BAP, refer to Chapter 7.

Enabling Bandwidth-on-Demand Service

The leased line, demand line, or leased multilink bundle is the physical connection over which the leased or demand circuit (the logical connection) carries traffic. The procedure for enabling bandwidth-on-demand service differs for leased circuits and demand circuits.

For a leased circuit, you designate the circuit as a *bandwidth-on-demand circuit*. This instructs the router to provide secondary dial-up lines if the leased circuit becomes congested.

For a demand circuit, the PPP Demand Circuits window includes a BW on Demand button that lets you associate the demand circuit with an existing bandwidth-on-demand pool. It also lets you configure bandwidth-on-demand monitor parameters that determine when the demand circuit is congested.

Bandwidth-on-demand service is supported on asynchronous lines (RS-449), synchronous lines (RS-449, V.35, RS-422, and X.21), and ISDN interfaces.

You can use the following types of lines and protocols for bandwidth-on-demand service:

- **Leased lines** -- A single leased line, a multilink bundle, a switched dial-on-demand line. Protocol supported: PPP multilink.
- **Secondary dial-up lines** -- Any WAN line. Protocols supported: asynchronous or synchronous PPP multilink, BAP for ISDN lines.

The leased lines and secondary dial-up lines may operate at different speeds.

Figure 2-10 shows how secondary lines support a leased connection.

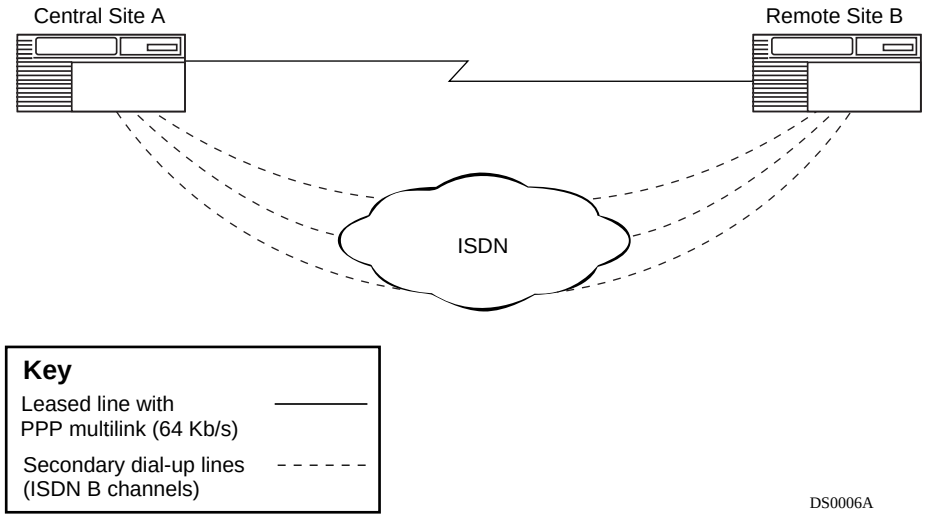


Figure 2-10. An Example of Bandwidth-on-Demand Service

Initially, the router brings up one secondary line to alleviate congestion. If the congestion persists, the router activates a second and then a third line until the congestion subsides. Each new line the router activates becomes part of a multilink bundle. The router then balances traffic over the bundle. Once the volume of traffic decreases, the router deactivates the secondary lines, one at a time.

A router on one side of the connection monitors byte counts for the data it sends and receives. This router is called the *monitor router*. The monitor router uses these byte counts, along with bandwidth-on-demand monitor parameters, to determine when to activate additional lines for more bandwidth. The router then uses all the available lines in the bundle to send data across the network.

The router on the other side of the connection is the *non-monitor* router. The non-monitor router cannot activate additional dial-up lines. If you configure BAP for ISDN connections, the non-monitor router has a more active role in determining how additional lines are activated for more bandwidth. Refer to Chapter 7 for more information about BAP.

Bandwidth-on-Demand Lines and Pools

A *bandwidth-on-demand pool* is a collection of dial-up lines that a congested leased line, demand line, or multilink bundle can use. Each bandwidth-on-demand pool is identified by a *bandwidth-on-demand pool ID*.

In a bandwidth-on-demand pool, you can combine asynchronous, synchronous, or ISDN lines in a single pool. Lines in a backup pool can connect to a modem, directly to a PSTN (using the ARN with the V.34 Modem Adapter Module), or directly to an ISDN network (using a router with integral ISDN capability).

You can combine asynchronous, synchronous, and ISDN interfaces in a single pool. The synchronous interfaces can use Raise DTR or V.25bis signaling for modem connections. The asynchronous interfaces can use Raise DTR, V.25bis, or Hayes signaling for modem connections. Hayes signaling requires that you use AT modem commands to send dialing instructions to the modem. The ISDN lines use ISDN signaling for network connections.

Lines in a bandwidth pool may operate at different speeds. PPP multilink, the protocol that the router uses for bandwidth-on-demand circuits, can manage lines of varying speed, distribute traffic across lines, and monitor traffic. The router may also use BAP to manage bandwidth allocation.

When a leased line or bundle becomes congested, the router searches for an available dial-up line from its associated bandwidth-on-demand pool. Lines in a bandwidth-on-demand pool can reside on any slot, but each secondary circuit can use only three slots.

To determine the order in which the router searches the slots, you designate each slot as *preferred* or *reserved*. The router uses the preferred slot first. If there are no available lines, the router uses the reserved slot. If there are still no available lines, the router automatically uses the *local* slot, which is the slot containing the first leased line that was activated. Once the router finds a line, it dials the destination using a phone number from the user-configured outgoing phone list.

How Lines, Pools, and Circuits Work Together

You assign a pool ID for each leased circuit or demand circuit. If the line or bundle becomes congested, the router activates a dial-up line from the pool. The dial-up circuit that runs over this line inherits the configuration and protocol characteristics of the leased circuit.

You can assign the same bandwidth pool ID to more than one circuit. If you want a pool of dial-up lines dedicated to a specific bandwidth circuit, assign the pool exclusively to that circuit. Remember to first configure a leased or demand connection before configuring bandwidth-on-demand service.

Activating Dial-up Lines to Relieve Congestion

If one dial-up line from the bandwidth pool does not relieve the congestion, the router adds up to 29 lines until the congestion is relieved. The router activates additional lines only for a congested line, not for a failed line.

PPP multilink detects a state of congestion based on byte counts and the user-defined monitor parameters. (Byte counts are measured prior to data compression.) The monitor parameters let you define congestion thresholds for the leased or demand circuit. If data traffic exceeds a threshold, the router tries to activate a dial-up line. At this point, if you configure BAP, it manages the addition and removal of lines from the multilink bundle, based on the monitor parameters. For more details about BAP, refer to Chapter 7.

Once the volume of traffic on the congested line falls below the congestion threshold, the router again uses only the leased line, demand line, or bundle. Refer to Chapter 11 for details about the monitor parameters.

Terminating Secondary Lines

The router terminates secondary lines when

- The leased line or multilink bundle fails.
- The leased circuit is no longer congested.
- The remote router terminates the connection.
- There is a physical problem with the dial-up line.

Sample Bandwidth-on-Demand Application

In Figure 2-11, the leased line is congested due to bridge/routing protocol traffic. The BLN in Rome, designated as the monitor router, has determined the line is congested based on the monitor parameter values. Consequently, the router brings up an ISDN B channel as a secondary line.

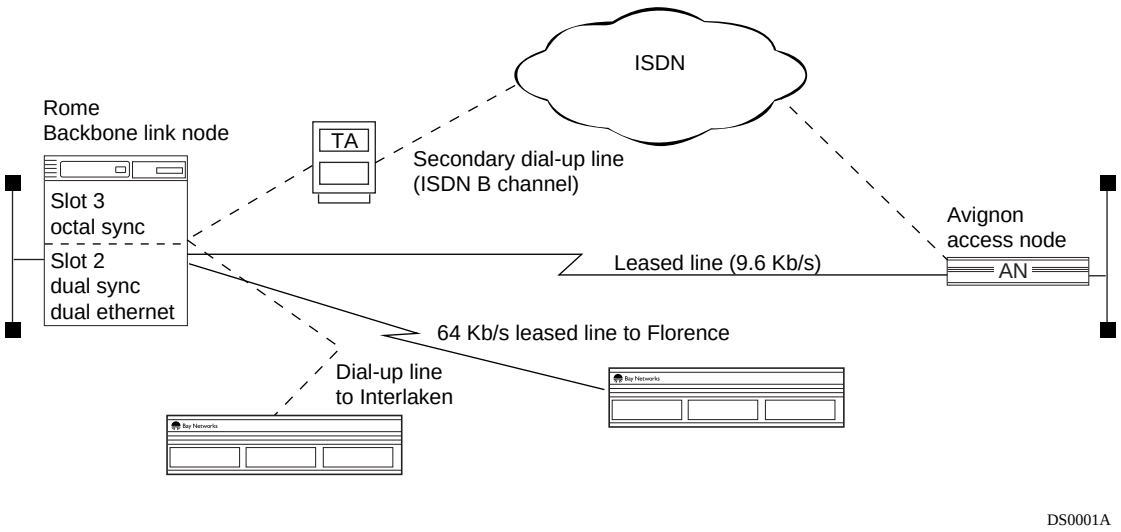


Figure 2-11. Sample Bandwidth-on-Demand Network

The monitor router brings down the secondary line once the level of congestion falls below the configured percentages. In addition to supporting the leased line to Avignon, the B channel can also act as a backup line for the leased line from Rome to Florence and as a demand line from Rome to Interlaken.

Using the Same Line for All Dial Services

You can use the same physical line for dial-on-demand, dial backup, and bandwidth-on-demand pools. For example, if the router is not using a line for a dial-on-demand connection, it can use the line for a dial backup connection. If there are several requests for the same line, the router uses the line for the service requested first.

If several pools use the same line, a combination of the letters D (demand), B (backup), and W (bandwidth) appear next to the connector name in the Configuration Manager window (for example, **COM1DW**). These letters appear only next to COM and ISDN connector names.

Chapter 3
ISDN Overview

Integrated Services Digital Network (ISDN) is an internetworking technology that integrates voice, data, and video communication over end-to-end digital connections (Figure 3-1). From an internetworking perspective, the router can use ISDN to provide LAN interconnection services over a wide area.

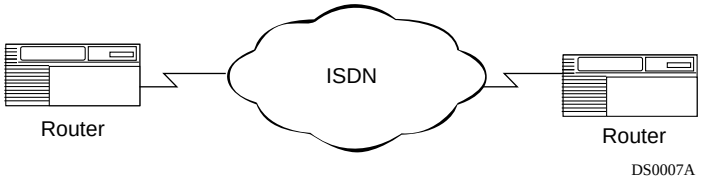


Figure 3-1. Sample ISDN Network

Because ISDN integrates services and offers multiple communication channels, it is more versatile than traditional network services that support only one channel. With ISDN, you can use the same lines and equipment for a variety of communication needs. Also, using digital lines, as opposed to analog lines, eliminates the need to convert digital to analog signals and provides faster and more accurate communication.

In addition to offering integrated services, ISDN provides a number of standard, universal interfaces to access ISDN services. With a defined set of interfaces, you can purchase ISDN equipment and services from different providers and all the parts of your network will have the same interfaces to connect to one another as well as to the ISDN network.

ISDN is primarily a dial service that uses switched connections as circuits. This means that you can use channels and services on an as-needed basis instead of having a connection up all the time, regardless of need. This choice ensures a cost-effective use of phone lines as well as bandwidth efficiency.

ISDN Standards

The ITU-T (formerly CCITT) has defined a set of standards to ensure universal implementation of ISDN technology. The following sections describe some of these standards.

Basic Rate Interface

BRI transmits data at a rate of 64 Kb/s over each of two *bearer* channels, also called *B channels*, which are dedicated to data transmission. Along with the two B channels, BRI uses one *data channel* called the *D channel*. The D channel handles all signaling information such as call setup requests. It transmits this information at a rate of 16 Kb/s.

The networking industry also refers to BRI service as 2B + D to denote the combination of the two B channels and one D channel. These three channels are combined into one physical, twisted-pair line that terminates at your premises and provides a total of 144 Kb/s bandwidth (Figure 3-2).

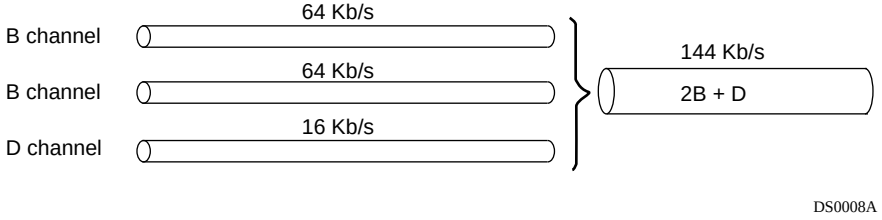


Figure 3-2. The BRI Interface

Primary Rate Interface

PRI is the other ISDN service. In the United States, Canada, and Japan, PRI transmits data at a rate of 64 Kb/s over 23 B channels, and sends signaling information at a rate of 64 Kb/s over one D channel (23B + D). In Europe, PRI transmits data at the same rates with 30 B channels and one D channel (30B + D). PRI channels combine into two physical, twisted-pair lines.

There are two types of PRI service because the United States, Canada, and Japan derive the PRI transmission rates from the T1 standard, which operates at line speeds of 1.544 Mb/s. Europe and Australia, however, use the E1 standard, which operates at line speeds of 2.048 Mb/s.

The D Channel

The D channel is integral to ISDN services. It provides out-of-band signaling, which means that the line that carries signaling information is separate from the line that carries data. Using out-of-band signaling, call setup information does not interfere with the data you send, and the result is more accurate communication.

The D channel also provides what the ITU-T (formerly CCITT) defines as supplementary services. These are extra services that you can purchase from your ISDN provider, for example, calling line ID, which enables you to determine the phone number of the incoming call.

Link Access Procedure-D

To perform call setup and signaling functions between your equipment and the ISDN network, the ITU-T defined recommendation Q.921, which outlines Link Access Procedure-D (LAPD), the data link layer protocol for the D channel. ISDN uses LAPD to establish a switched connection on a particular B channel. The B channel then allows data to travel between the two end points of that connection.

LAPD transmits information in frames. The fields in a LAPD frame contain addresses, control, and frame-check sequence information. The address and control information comprise the LAPD header, which sequences the packets and keeps them in the right order. The frame-check sequence allows the receiver of a frame to detect any errors that may have occurred during transmission.

Unlike other data link layer protocols, LAPD can handle multiple users on the same multiaccess interface. Figure 3-3 shows a LAPD frame.

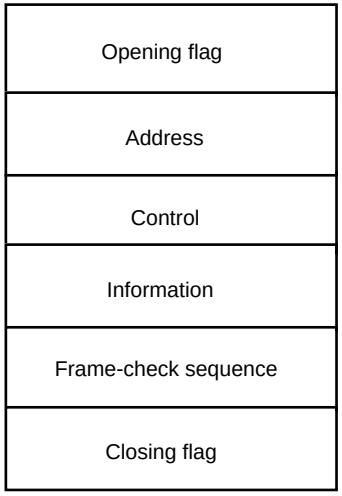


Figure 3-3. LAPD Frame

The fields in the LAPD frame are as follows:

- The **opening flag** and **closing flag** fields are High-level Data Link Control (HDLC) flags that separate one frame from the next.
- The **address** field contains two kinds of information. It provides a data-link layer entity; more specifically, a logical point that defines the data link between the user and the network. This portion of the address is the service access point identifier (SAPI). The address field also contains a number to identify the terminal equipment connected to the ISDN network. This is the terminal endpoint identifier (TEI). Either the network assigns a unique number to each device or you set this number at the device.
- The **control** field identifies the type of frame. This field also contains sequence numbering.
- The **information** field contains data to set up the link.
- The **frame-check sequence** is a cyclic redundancy check (CRC).

Call Control on the D Channel

ITU-T recommendation Q.931 outlines standards for out-of-band call control at the network layer for ISDN communication. The primary function of call control is to set up and take down ISDN calls on the B channels.

ISDN Interfaces

One of the key concepts in ISDN is a set of universal interfaces that allow you to purchase equipment and services from any ISDN provider. All providers can therefore implement ISDN similarly. ITU-T created a set of physical and logical interfaces to accomplish this goal.

ITU-T divides ISDN interfaces into two categories: functional groups and reference points. The following sections describe these two groups.

Functional Groups

Functional groups perform specific tasks that are necessary for you to access an ISDN network. These groups combine physical devices and functional points in an ISDN network, as follows:

- **Terminal equipment 1 (TE1)** -- ISDN-compatible devices, for example, the router with an ISDN/BRI module
- **Terminal equipment 2 (TE2)** -- Non-ISDN-compatible devices, such as analog phones and PCs
- **Network terminator 1 (NT1)** -- The point where the phone company's wires end at your premises
- **Network terminator 2 (NT2)** -- The point where any switching services occur at your premises
- **Line terminator (LT)** -- The point where your network lines terminate at the phone company's central office
- **Exchange terminator (ET)** -- Located at the phone company's central office, it performs the switching exchange functions
- **Terminal adapter (TA)** -- Provides ISDN connectivity to non-ISDN devices

Reference Points

Reference points, also called *interfaces*, bring two functions together. A reference point may be physical, along the ISDN line, or merely a conceptual point where functions merge. There are four main reference points in an ISDN network:

- **R reference point** -- The point between the non-ISDN device and a terminal adapter. It is the boundary between your equipment and the ISDN network.
- **S reference point** -- The point between the terminal equipment and the switching device at your premises.
- **T reference point** -- The point between your switching device and the subscriber side of the local loop, that is, the wire between your phone and the phone company's central office.

Note: Any device that can connect to an S reference point can connect to a T reference point, because the devices are the same electrically.

- **U reference point** -- The point between the NT1 (where the phone company's line ends at your premises) and the phone company's central office. It is where the subscriber side and network side of the local loop meet.

  This point is different in North America than in Europe. In North America, the subscriber side of the local loop includes the NT1, so the U point is further out on the network. In Europe, the NT1 is part of the service provider's side or network side of the local loop, so the S/T point is where the subscriber and the network meet.

Figures 3-4 and 3-5 show two ISDN networks with functional groups and reference points.

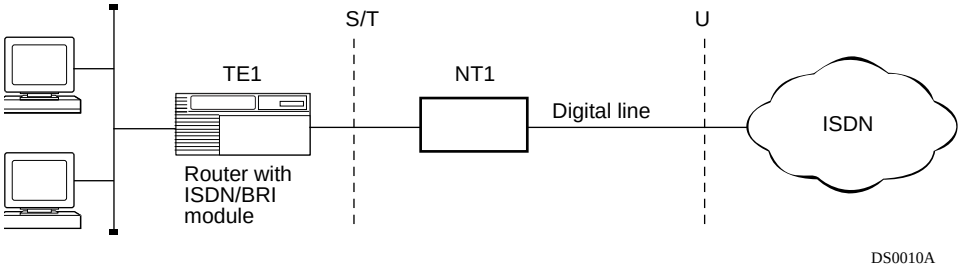


Figure 3-4. Reference Points and Functional Groups for Devices

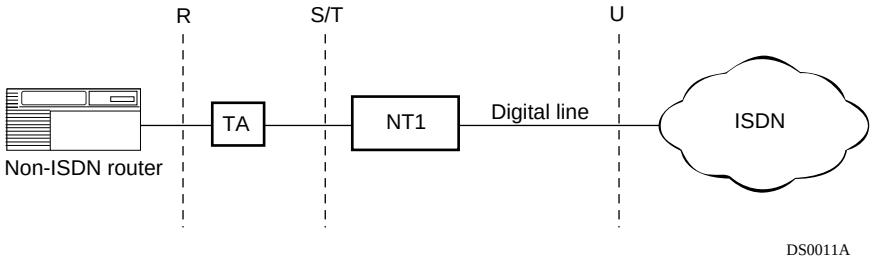


Figure 3-5. Reference Points and Functional Groups for Non-ISDN Devices

For More Information about ISDN

For detailed information about ISDN protocol design and implementation, refer to the following:

Deming, R. *ISDN -- The Network Architecture of the Future.* Bell Communication Research Technical Education Center, New Jersey.

Goldstein, F. *ISDN in Perspective*. Reading, Mass.: Addison-Wesley, 1992.

Kessler, G. *ISDN*, 2d ed. New York: McGraw-Hill, 1993.

Motorola University Press. *The Basics Book of ISDN*. Network Information Center (NIC), SRI International. Reading, Mass.: Addison-Wesley, third printing, January 1994.

Newton, H. *Newton's Telecom Dictionary*, 10th ed. New York: Flatiron Publishing, 1996.

Stallings, W. *ISDN and Broadband ISDN*, 3rd ed. New York: Macmillan, 1995.

Stallings, W. *ISDN: An Introduction*. New York: Macmillan, 1989.

Chapter 4
Implementation Notes for All Dial Services

This chapter describes Bay Networks implementations for all three dial services.

Point-to-Point Protocol

You can use Point-to-Point Protocol (PPP) across dial-up lines for any dial service. Site Manager automatically configures PPP on lines in a bandwidth pool. For lines in a demand or backup pool, PPP is not configured automatically; you must select it. PPP routes, or bridges, datagrams over point-to-point lines. Synchronous, asynchronous, and ISDN interfaces all use PPP.

PPP Authentication

Dial circuits use a PPP identification mechanism to identify the calling router to the called router. The identification mechanism relies on one of two PPP authentication protocols: Challenge Handshake Authentication Protocol (CHAP) or Password Authentication Protocol (PAP). These authentication protocols implement a security feature that identifies peer routers to one another.

CHAP is the default authentication protocol. To select PAP, you must open the PPP Interface List window, select the line record for dial services, and specify PAP for the Local Authentication Protocol parameter. For more information about CHAP and PAP, see *Configuring PPP Services*.

The identification process takes place during PPP link negotiation, which occurs before the routers establish a connection to send protocol data. Enabling the called router to dynamically identify the calling router lets a single dial interface (ISDN or modem) at a remote router serve as the connection point to multiple routers.

When you configure a PPP connection, Site Manager automatically creates a generic PPP line record that all pools use for identification. To implement authentication, you must set up the router's caller resolution table.

Types of Authentication

You can configure *one-way authentication* or *two-way authentication*. In two-way authentication, both routers can authenticate each other. In one-way authentication, only the called router can authenticate.

Two-Way Authentication

Figure 4-1 shows an example of two-way authentication.

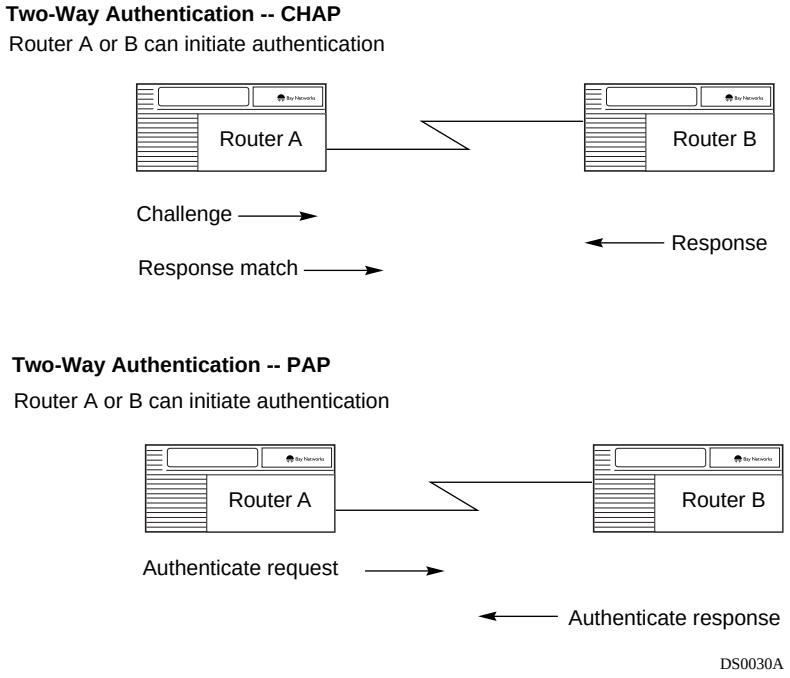


Figure 4-1. Two-Way Authentication

For CHAP, Router A initiates a CHAP challenge, and Router B responds. Router A responds with a response match and the connection is activated. Router B can also initiate a CHAP challenge.

For PAP, Router A sends an authenticate request to Router B. Router B sends an authenticate response and then activates the connection. Router B can also initiate an authenticate request.

Both Routers A and B can use PAP and CHAP in a single line pool. If Router B rejects the CHAP challenge, and Router A has the PAP Fallback parameter enabled, Router A switches to PAP and reattempts the authentication.

One-Way Authentication

Figure 4-2 illustrates one-way authentication. For CHAP or PAP, the calling router does not try to authenticate the called router, but it does recognize and respond to CHAP challenges or PAP authentication requests from the called router. The called router does authenticate the calling router. Using one-way authentication, the router can communicate with other devices that may not support two-way authentication.

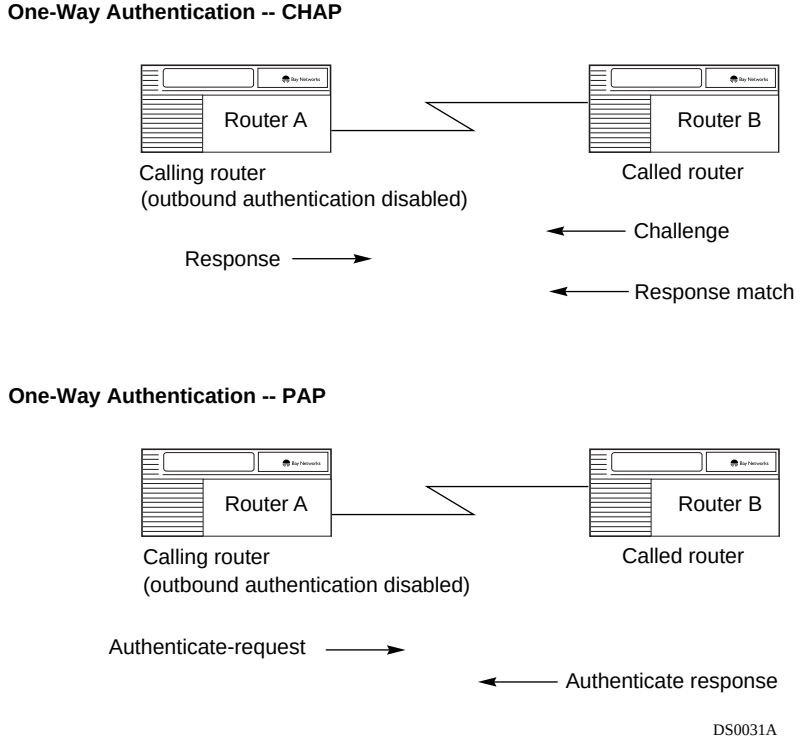


Figure 4-2. One-Way Authentication

The receiving router can use PAP and CHAP in a single line pool. If Router A rejects the CHAP challenge, and Router B has the PAP Fallback parameter enabled, Router B switches to PAP and reattempts authentication. If PAP Fallback is not enabled, the connection is activated.

Configuring the Type of Authentication

The Outbound Authentication parameter determines the type of authentication the router uses. You enable this parameter to use two-way authentication and disable it to use one-way authentication. The parameter is in the circuit definition window of each dial service. Refer to the appropriate chapter for configuring circuits.

Using CHAP Names and PAP IDs for Authentication

Authentication occurs before the routers establish a connection. The router at one or both ends of the connection must agree on the CHAP name and secret or PAP ID and password so PPP can identify the caller and activate the correct circuit.

Figure 4-3 shows an example of routers using CHAP for authentication. PAP works in a similar way. This example uses two-way authentication.

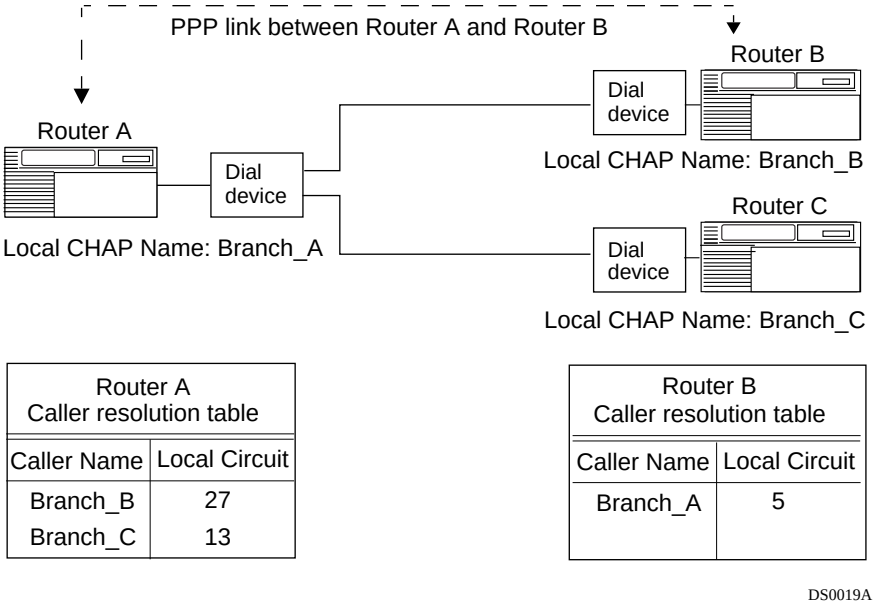


Figure 4-3. Routers Using CHAP for Authentication

In Figure 4-3, Routers A and B each have a caller resolution table that maps local circuits to the names of remote callers.

Router A calls Router B. When Router A makes the call, it places its local CHAP name, Branch_A, and CHAP secret in the CHAP challenge message. Router B's caller resolution table shows Branch_A assigned to Circuit 5, the connection to Router A. When Router B receives the call, it looks in its table, confirms Router A's CHAP name (referred to as the Caller Name in the table) and CHAP secret, and activates Circuit 5.

Conversely, when Router B calls Router A, it places its local CHAP name, Branch_B, in the CHAP challenge message. Router A looks in its table, verifies that Router B is an authorized caller, and brings up Circuit 27, the connection to Router B.

PAP is similar to CHAP, but PAP uses a PAP ID and password as part of the identification process. The calling router places its PAP ID and password in the authenticate request to the called router. The called router first looks in the caller resolution table to find the PAP ID (referred to as the Caller Name in the table). If the router finds the PAP ID, it then checks the table for the password associated with the ID and compares it to the password in the authenticate request. If the passwords match, the router brings up the circuit.

To configure the caller resolution table, refer to Chapter 13. For more information about CHAP names and PAP IDs, see *Configuring PPP Services*.

Asynchronous PPP

Asynchronous PPP provides communication for asynchronous interfaces on the AN®, ASN, and ANH™ (using the Dual Sync Net Module); ARN (using any Serial Expansion Module); and BLN and BCN (using the Octal Sync Net Module). There are several advantages to asynchronous communications:

- **Low cost** -- Analog lines are less expensive than high-speed digital lines. Asynchronous modems are less expensive than synchronous modems. You can also dial directly into the router without using a terminal server or other port-concentration devices.
- **Effective use of router hardware** -- You can use an available serial port on the router for a dial-up application.
- **Line availability** -- Analog lines are available in most locations, enabling you to dial in from any remote location.
- **Throughput** -- With the V.34 standard, throughput for asynchronous modems is 28.8 Kb/s. Using the V.42bis compression standard, throughput can be higher.

Figure 4-4 shows a network that uses asynchronous PPP over modem lines.

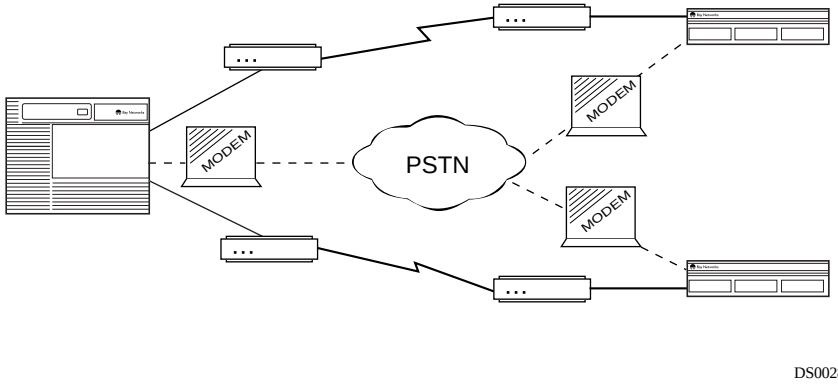


Figure 4-4. Using Asynchronous PPP over Modem Lines

Using low-cost asynchronous modems makes asynchronous PPP ideal for customers with small networks who are trying to lower expenses.

All dial services can use asynchronous PPP for connections between two routers. Only demand and backup service can use asynchronous PPP for connections between a router and a terminal server.

All protocols that can operate with PPP, CHAP, and PAP can operate with asynchronous PPP. Asynchronous connections also support software and hardware data compression.

Configuring Modems for Asynchronous PPP Interfaces

Site Manager simplifies modem configuration for asynchronous dial-up connections that use Hayes signaling. Site Manager provides the following list of commonly used modems that you can choose for your network:

- US Robotics Courier V.Everything
- Hayes Optima 288
- Cardinal MVP 288XF
- Supra 288 Fax Modem
- Zoom V.34X
- Microcom DeskPorte Fast
- BayStack ARN V.34 Modem Adapter Module
- MultiTech Multimodem II MT1432
- Paradyne Comsphere 3820
- Motorola Codex 3261
- Boca V.34 Modem MV.34E

When you select a modem from the list, the AT initialization string is set automatically, as well as the speaker volume, speaker control, and number of rings to answer. (You can modify these default settings.) If your modem is not on the list, you can configure a custom modem and AT initialization command. The AT initialization command is required for custom modems. Appendix E lists the AT initialization commands for the ARN. Your modem may use a different set of commands, so refer to the manual for your modem.

You configure modems for asynchronous communication in the Async Hayes Modem Interface window. You can access this window only if the WAN Serial Interface Type is Asynchronous and the Line Media Type is Hayes. Refer to Chapter 1 to learn how to set these two parameters. Refer to Chapter 8 for instructions on modifying your modem configuration.

The BayStack™ ARN router has an optional V.34 Modem Adapter Module that requires you to configure an AT initialization command whether the interface is synchronous or asynchronous.

RADIUS Accounting Services

As networks grow to accommodate more remote dial-in users, network security, network use, and billing become more difficult to manage. Remote Authentication Dial-In User Service (RADIUS) centralizes security and accounting information, improving security and providing a solution that adapts to the changing needs of the remote user and service providers.

RADIUS operates between a client and a server. The router is the RADIUS client. RADIUS accounting requires that you configure one of the three dial services. The dial service enables the router to activate a dial-up connection for RADIUS calls. Dial-up calls are active for a limited time period; therefore, the RADIUS server can measure the duration of the call and count the number of packets transmitted to determine billing charges. To learn more about RADIUS, refer to *Configuring RADIUS*.

For accounting services, you can configure either a dial service or RADIUS first.

The following Bay Networks platforms can operate as a RADIUS client:

- Backbone Link Node (BLN)
- Backbone Concentrator Node (BCN)
- Access Stack Node (ASN)

Note: The BLN, BCN, and ASN also support RADIUS authentication, but only with dial-on-demand service. Refer to Chapter 5 for more information.

IP Adjacent Hosts

If you configure IP numbered interfaces over a dial circuit, you must configure adjacent hosts to ensure that data follows the correct path.

An IP adjacent host is the next hop (that is, IP address) along the transmission path that the data must follow. For example, in Figure 4-5, the Los Angeles router is an adjacent host to the New York router.

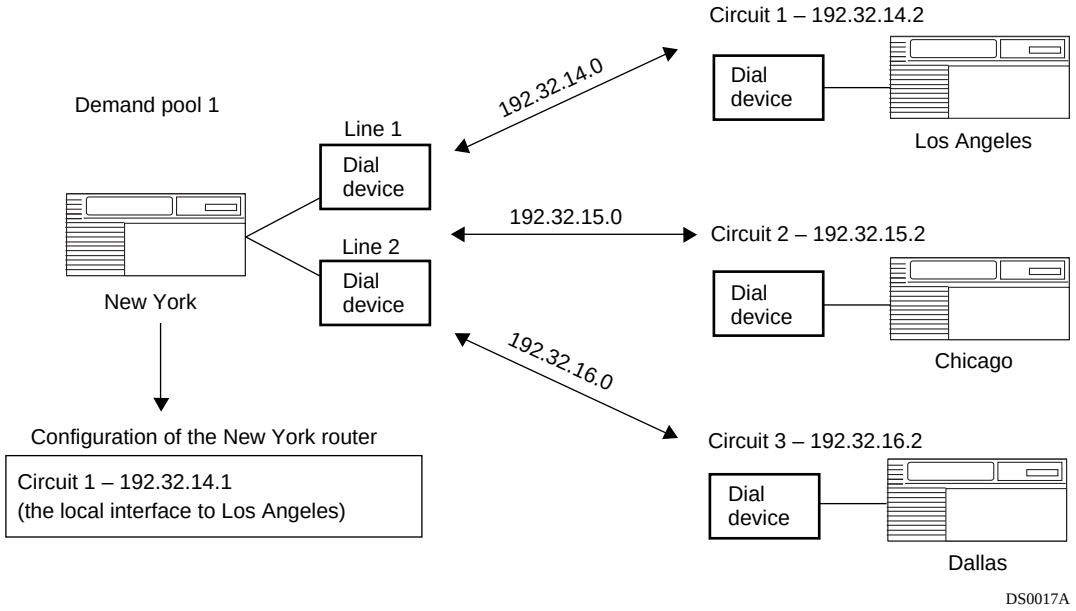


Figure 4-5. IP Adjacent Hosts

To reach the Los Angeles router, you must configure the New York router's local IP address, which is 192.32.14.1. You must also configure the New York router's adjacent host entry, which is 192.32.14.2, the address of the Los Angeles router. These two entries designate the correct path from New York to Los Angeles.

Although you must configure IP adjacent hosts, do not configure IPX adjacent hosts. Adjacent hosts are not required for IPX to work over PPP circuits.

An alternative to configuring adjacent hosts is to configure IP unnumbered interfaces. An unnumbered interface is a point-to-point connection that does not use an IP address. Instead, you configure the address to be 0.0.0.0. You can use unnumbered interfaces to advertise routing information across the network. Since all traffic over an unnumbered interface uses broadcast addressing at the data link layer, you do not need adjacent hosts.

Adjacent hosts and unnumbered interfaces are features of the router's IP interface. To configure these features, refer to *Configuring IP Services*.

ISDN Services

A router with built-in ISDN capability is a TE1 device, which is an ISDN-compatible device. This means that the router provides the S/T interface, which defines the boundary between the user and the network. (The ARN also provides the U interface, which includes an integral NT1 interface.) The NT1 interface defines the point at which the service provider's wires terminate at your site.

For BRI service, the S/T interface follows the standards outlined in ITU-T recommendation I.430, the physical layer protocol that defines the S/T interface. For PRI service, the interface follows ITU-T recommendation I.431.

You have an S interface only if an NT2 device is present. An NT2 is a switch at your site that connects your TE1 and TE2 equipment to the network.

Figure 4-6 shows the router in a sample ISDN network.

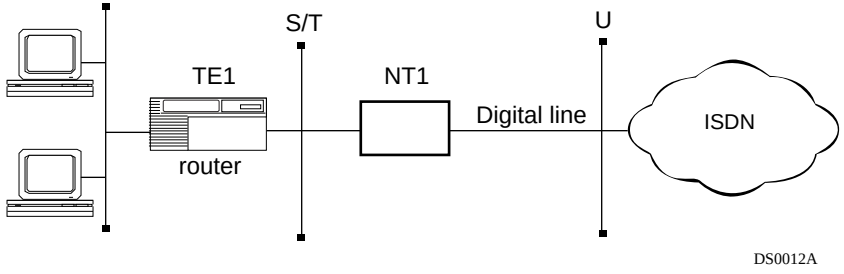


Figure 4-6. Router in an ISDN Network

The following sections explain ISDN operation on your router.

BRI Service on the AN, ANH, ASN, and ARN

The AN, ANH, ASN, and ARN support the BRI standard for ISDN using an integrated ISDN/BRI Link module.

Note: The ARN can only use three B channels. If you select 2B + D service for one BRI interface, you must use 1B + D service for the second interface.

The ISDN/BRI module allows you to connect directly to the ISDN network instead of connecting via a terminal adapter. With BRI, you reduce equipment costs and simplify connections to an ISDN switch.

The BRI implementation supports all three dial services. In addition, the implementation supports an ISDN leased-line application (for Germany only). Subsequent chapters in this manual describe how to configure each service to connect to an ISDN network.

B Channel Support

In keeping with the BRI standard, each port on the ISDN/BRI module provides two 64 Kb/s B channels for data transmission, allowing communication with two remote locations simultaneously.

D Channel Support

The router supports full 16 Kb/s D channel signaling and call setup and teardown between the router and ISDN switch. The D channel implementation complies with the ITU-T (formerly CCITT) 1988 recommendations Q.921 and Q.931, and provides signaling support for the following countries:

- INS-64, KDD, and NTT for Japan
- TS013 for Australia
- National ISDN 1, AT&T 5ESS Custom, and NT DMS-100 Custom for the United States and Canada
- Swissnet 3 for Switzerland
- NET3 for Austria, Belgium, Denmark, France, Germany, Italy, Netherlands, Norway, Spain, Sweden, Switzerland, and the United Kingdom

Bay Networks routers do not support data transmission across the D channel.

BRI Leased-Line Operation for Germany and Japan

For BRI service in Germany and Japan, you can configure a permanent point-to-point ISDN connection over a B channel, without having to use the D channel to dial the call. This connection operates like a leased line and is useful when ISDN service providers do not use the D channel.

Leased-line operation supports PPP, Bay Networks Standard, and Frame Relay.

Site Manager allows you to select leased-line operation when you configure the application mode for your BRI interface. Refer to Chapter 8 for more information.

BRI Subaddresses

The ITU-T specifies that one S/T interface can have eight different TE devices, for example, routers. However, the service provider may assign only one phone number for the customer side of the local loop. To determine the specific destination of the call, the router uses a *subaddress*.

Each router has an assigned subaddress for which it will accept calls. The subaddress must be part of the incoming call setup message sent to the router. Based on the subaddress, the router determines if it is the intended receiver. If not, the router ignores the call.

Floating B Option for the AN and ANH

If your ISDN service provider only offers 2B + D service, the floating B option for the AN and ANH enables you to use only one B channel for dial service applications. Floating B is an alternative if you cannot purchase 1B + D service.

If your service provider offered only 2B + D service, the AN and ANH CPU would use two of its four serial communications controllers (SCCs) for the two B channels, one SCC for the Ethernet link, and one SCC for a synchronous link. Using the floating B option, you use only one B channel at a time, freeing up an SCC for an additional synchronous link.

You can use floating B if your network integrates an ISDN dial backup connection with network devices that send protocol traffic such as SDLC or X.25. This type of application requires the following interfaces:

- One synchronous interface for SDLC or X.25 traffic
- One synchronous interface for the primary link to the backbone network
- One ISDN B channel for the dial backup link

If you use 2B + D service without configuring floating B, the AN provides only one synchronous interface, so you cannot integrate the dial service with other network applications. However, by configuring floating B, you can configure two synchronous interfaces: one Ethernet link and one B channel. The router software maps whichever B channel is in use to a single SCC.

To implement the floating B option, select Dialup - Floating B for the Port Application Mode parameter (refer to Chapter 8). The router makes the necessary adjustments so that only one B channel is available.

PRI Service on the ASN, BLN, and BCN

The ASN, BLN, and BCN provide PRI service using the following modules:

- 120-ohm Single Port MCE1-II Net Module (ASN only)
- Single or Dual Port MCT1 Link Module (BLN and BCN only)
- 120-ohm Single or Dual Port MCE1-II Link Module (BLN and BCN only)
- QMCT1 Link Module (BLN and BCN only)

PRI allows you to connect directly to the ISDN network instead of connecting via a terminal adapter. PRI is a cost-effective solution when the number of BRI channels required for an application exceeds the cost of a single PRI line. The cost savings depend on each country's tariffs.

All three dial services can use PRI connections. Subsequent chapters in this manual describe how to configure each service to connect to an ISDN network.

B Channel Support

In keeping with the PRI standard, each port on the MCT1 Link Module provides 23 B channels operating at 64 Kb/s for data transmission. Each port on the MCE1 Link Module provides 30 B channels operating at 64 Kb/s for data transmission.

D Channel Support

The router supports full 64 Kb/s D channel signaling and call setup and teardown between the router and ISDN switch. The D channel implementation complies with the ITU-T 1988 recommendations Q.921 and Q.931, and provides signaling support for the following switches:

- Net5 for Austria, Belgium, Denmark, France, Germany, Italy, Netherlands, Norway, Spain, Sweden, United Kingdom, Switzerland, Finland, Greece, Iceland, Ireland, Luxembourg, and Portugal
- AT&T 5ESS and 4ESS Custom and DMS-100 Custom for the United States
- DMS-100 Custom for Canada
- NTT and KDD for Japan
- TS014 for Australia

Bay Networks routers do not support data transmission across the D channel.

Selective PRI Service

Your ISDN service provider may offer a service option with only a fixed number of B channels out of the full complement of B channels for PRI. This subset of channels is offered at an economical rate.

The ISDN service provider limits the number of channels by keeping the unavailable channels busy. Consequently, the router can use only what is available.

If you select this option, Site Manager lets you select only those channels available for communication. For example, if the provider offers channels B1 through B6, you configure only channels 1 through 6. You should not select all the B channels; your configuration should match your service.

PRI Multirate

PRI multirate enables you to group B channels in multiples of 64 Kb/s to dynamically allocate bandwidth on a call-by-call basis. Depending on how many B channels you combine, the bandwidth can range from 128 Kb/s to 1472 Kb/s. This allows you to choose the most suitable bandwidth for an application.

Applications such as dial backup and video conferences benefit from the flexibility of multirate service. These applications require more than one B channel but not the full complement of B channels for PRI. Also, ISDN service providers offer multirate service at lower tariffs than other ISDN services. Multirate is especially useful when Frame Relay is used across an ISDN line. You can group multirate dial lines to provide backup connections if the primary connection fails.

Multirate service is available for all three dial services on the ASN, using only the Dual MCT1 Net Module, and on the BLN and BCN, using only the Dual or Single Port MCT1 and QMCT1 Link Modules. The following switches for North America and Canada support multirate service:

- AT&T 5ESS
- AT&T 4ESS
- DMS-100

For these switches, you can group from 2 to 23 B channels, supplying bandwidth from 128 Kb/s to 1472 Kb/s.

Placing Multirate Calls

Both ends of a connection must support multirate for it to work. You enable multirate and specify the transmission rate of each multirate call when you configure an outgoing phone number for a circuit. (Refer to Chapter 12 for specific instructions.) Each multirate call can operate at a different transmission rate. You determine the transmission rate by specifying the number of B channels the circuit can use for a phone number. The greater the number of B channels, the faster the transmission rate because the circuit has more bandwidth.

You can place several multirate calls over the same PRI connection; however, the total number of B channels for each call cannot exceed the number of lines in the pool or the number of lines supported by the network switch. If there are no available B channels in the line pool, the call fails.

Call setup across the D channel is simple. You set up a call only once, regardless of how many B channels are in use.

Note: If you enable multirate calls across a bandwidth-on-demand circuit, you must configure each line's external clock speed. Line speed is critical to balancing traffic across a multilink bundle, which is a group of dial-up lines that help reduce congestion on a leased line.

Incoming Call Filtering

Incoming call filtering is a security feature that works with the ISDN caller ID service. Incoming call filtering lets the router filter incoming calls based on the calling party's phone number. This feature is available for BRI and PRI service.

Caution: To use incoming call filtering, you must purchase caller ID service from your ISDN service provider. If you enable incoming call filtering without caller ID service, the router rejects all incoming calls.

The router filters incoming calls based on a list of phone numbers that you specify in an incoming phone list. The phone number you enter must exactly match the phone number that the switch sends to the router. If the phone number is included in the router's list, the router accepts the call. If not, the router rejects the call. This ensures that only authorized users have access to your network.

To activate this feature, enable the Incoming Filter parameter and create an incoming phone list. Refer to Chapter 12 for instructions.

Rate Adaption

Rate adaption enables the router to accommodate data transmission at a rate of 56 Kb/s over a 64 Kb/s B channel. Bay Networks only supports 56 Kb/s adapted to 64 Kb/s using the ITU-T V.110 type of rate adaption. You can enable rate adaption for BRI and PRI service.

For incoming calls, the router automatically adapts the data received at 56 Kb/s to the 64 Kb/s channel, based on information in the call setup packet. For outgoing calls, the router sets the rate to either 64 Kb/s or 56 Kb/s, depending on how you configure the rate adaption parameters.

To determine which rate to select, ask your service provider for information about the network and connecting to the destination device. For information about configuring rate adaption, refer to Chapter 8 and Chapter 12.

The following two examples describe how rate adaption works.

Example 1

Between two end nodes there are seven switches. One switch uses a 56 Kb/s trunk line (Figure 4-7). To accommodate this switch, the router sends data at 56 Kb/s over the 64 Kb/s line that connects the switch to the network. The router drops one of the eight bits of data from each byte and sends only seven bits of data at a time.

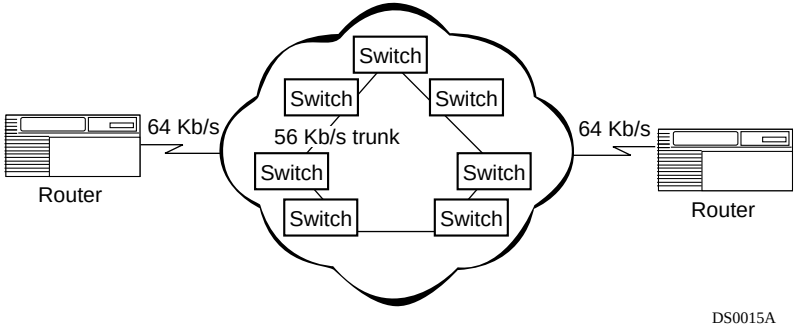


Figure 4-7. Rate Adaption for a Network with a 56 Kb/s Trunk Line

Example 2

For a connection between an ISDN and switched 56 Kb/s network (Figure 4-8), the router adapts the data rate for the outgoing call to 56 Kb/s to match that of the destination device, which can handle data only at 56 Kb/s. To do this, you set the adaption rate for the outgoing phone number to 56 Kb/s.

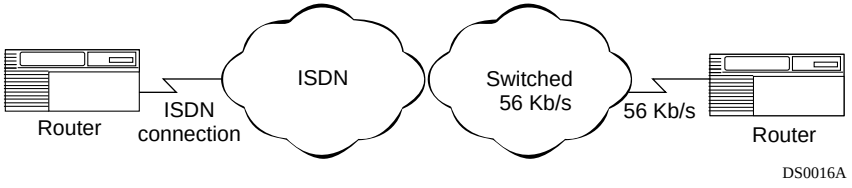


Figure 4-8. Rate Adaption for a Switched 56 Kb/s Network

X.25 Service over an ISDN D Channel (BRI only)

For routers used in France and Germany, you can send X.25 packets over an ISDN D channel to an X.25 network. This feature reduces the cost of X.25 network access because you do not have to use expensive leased lines. While the D channel is in use, you can use the B channels for other dial service applications.

This feature is based on ITU-T recommendation X.31, which specifies how an X.25 DTE communicates with an ISDN network. With the router's ISDN functionality, you dial into the ISDN network and send X.25 packets. These packets are directed to the packet handling (PH) function in the ISDN network, which processes an X.25 call and acts as a gateway between the ISDN network and the X.25 network.

X.25 service over the D channel is available only for BRI interfaces on the AN, ANH, ASN, and ARN using the single or quad ISDN/BRI module. A minimum of 8 Mb of memory is required to use this feature on these routers.

Recommendation X.31 states that packets sent over the D channel can travel at a maximum of 9600 bps. If you use a higher baud rate, you lose data.

X.25 calls are made to the destination device using X.25 addresses in the call request message. The router uses E.164 addresses for communication across the D channel to the ISDN network, and uses X.121 addresses to call an X.25 network directly. You specify the address in the X.25 packet configuration. Refer to *Configuring X.25 Services* for more information.

One method of implementing X.25 over the D channel is to configure PDN service. Refer to *Configuring X.25 Services* to learn how to configure PDN service. Another method of implementing X.25 over the D channel is to use IPEX single node switching. For information about IPEX and how to configure IPEX single node switching, refer to *Configuring X.25 Services*.

Figure 4-9 shows how X.25 is implemented over the D channel using PDN service.

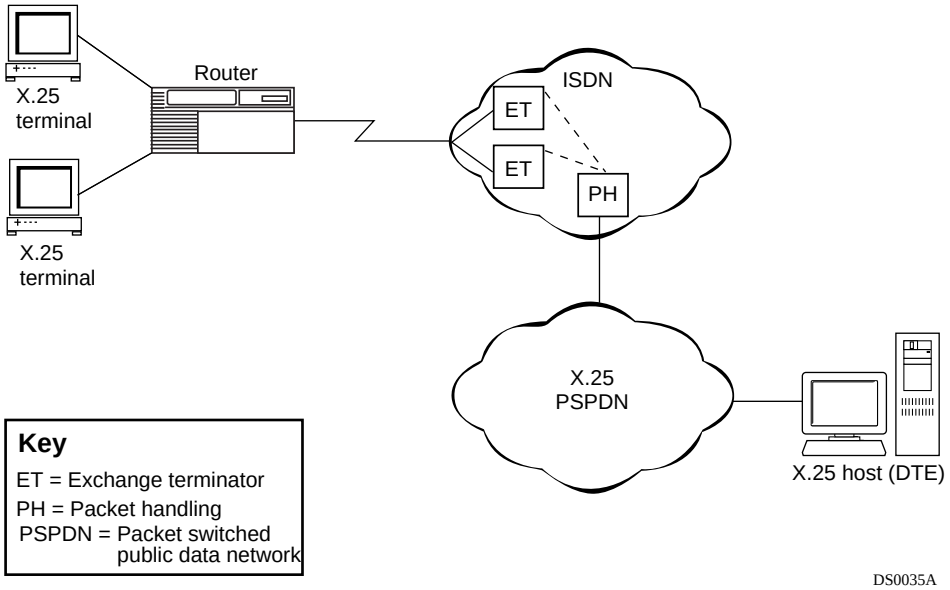


Figure 4-9. X.25 over the D Channel

Configuring X.25 Service over the D Channel

To configure X.25 service over the D channel, you enable the X.25 over the D Channel parameter in the BRI Interface Configuration window. The parameter enables this feature for each BRI line. You can configure multiple D channel interfaces with X.25. Refer to Chapter 8 for configuration instructions.

Once you enable the X.25 feature, Site Manager prompts you to configure the X.25 packet and service configuration.

Note: Site Manager modifies the ranges that you can set for certain packet and service parameters to accommodate data over the D channel.

Using the ping Command for ISDN Connections

To check the availability of a remote device in an ISDN network, you can use the **ping** command. The **ping** command sends an Internet Control Message Protocol (ICMP) echo request to a remote address that you specify. You can issue this command using Site Manager's Administration option, Ping from Router, or by using the Technician Interface.

Call setups for dial connections require more time than setups for ISDN connections. When you ping a remote device using the default timeout value, 5 seconds, it may fail because the router does not wait long enough for a response from the remote device. Therefore, you may want to increase the timeout value so the router will allow enough time for a response.

For information about using the **ping** command, refer to *Configuring and Managing Routers with Site Manager*. For information about using the Technician Interface, refer to *Using Technician Interface Software*.

Chapter 5
Dial-on-Demand Implementation Notes

This chapter describes Bay Networks dial-on-demand implementation.

Standby Circuits

The expansion of enterprise networks to remote branch sites requires reliable access to these sites. Therefore, it is important to have more than one connection to the remote sites in case a primary connection fails.

To provide additional connections, you can use *standby circuit*s. A standby circuit is a special type of demand circuit that gives the router another path to the destination. The destination can be a different interface at the primary circuit's original site, or an entirely different site.

Standby circuits support asynchronous (RS-449), synchronous (RS-449, V.35, RS-422, and X.21), and ISDN interfaces. PPP is the only data link layer protocol that you can configure over a standby circuit; you cannot use Frame Relay.

Comparing Standby Circuits with Dial Backup Circuits

Both standby circuits and dial backup circuits can back up failed primary circuits; however, they differ in the following ways:

- Each standby circuit has a unique configuration; it does not adopt the primary circuit's configuration. In contrast, most dial backup circuits inherit the primary circuit's configuration.

  This unique standby configuration offers flexibility when setting up other paths to remote sites. For example, you may want the standby circuit to have a different destination than the primary circuit, or you may enable compression on the standby circuit but not on the associated primary circuit.

- Standby circuits let you control when the router switches from the standby circuit back to the recovered primary circuit. You do not have this option with dial backup circuits. In dial backup configurations, the router terminates the backup circuit when the primary circuit recovers. For example, to ensure the stability of a recovered primary circuit before bringing down the standby circuit, you can delay the return of data to the primary circuit.

- Standby circuits support PPP multilink.

  You can assign a bandwidth-on-demand pool to the hot standby circuit to relieve congestion. Bandwidth-on-demand connections use PPP multilink, which lets the router use multiple dial-up lines simultaneously to transmit data. You do not have this option with dial backup circuits.

  If you associate a bandwidth-on-demand pool with a hot standby circuit, the router monitors the hot standby circuit for congestion. If the circuit becomes congested, the router activates lines from the bandwidth-on-demand pool until congestion is relieved.

For maximum flexibility and control when setting up alternative connections, and for quick responses to failed primary circuits, standby circuits are the best choice. However, for more straightforward applications, where you do not need to configure an alternative site for the backup connection, dial backup circuits are more suitable. Either option ensures that critical data reaches its destination.

How Standby Circuits Work

There are two types of standby circuits:

- **Hot standby** -- A hot standby circuit backs up a failed primary circuit. When the primary circuit fails, the router activates the hot standby circuit to provide another route to the destination. A hot standby circuit can connect to another standby circuit, a demand circuit, or a demand circuit group.

  Hot standby circuits can support the following types of primary circuits:

  - Single leased PPP circuit
  - PPP multilink circuit
  - PPP multiline circuit
  - Frame Relay primary circuit that has a service record with only one PVC

  Hot standby circuits can back up primary circuits on any slot, not just the slot on which the hot standby circuit resides. For example, if a primary line on Slot 4 fails, the router can activate a standby connection from Slot 3.

- **Standby** -- A standby circuit has no relationship with the primary circuit. It does not back up a primary circuit if that circuit fails. Instead, a standby circuit answers incoming calls destined for it. A standby circuit can also carry data when you activate it manually.

The router activates a standby circuit activates when

- A primary circuit fails.

  The router activates a hot standby circuit when the primary circuit fails. The hot standby takes over data transmission. To determine if a primary circuit failed, the router relies on Breath of Life (BofL) messages for PPP primary circuits and A-bit notification for Frame Relay primary circuits.

  When you associate a PPP primary circuit with a hot standby circuit, the router automatically enables BofL for the primary circuit, so be sure to enable BofL on the other side of the PPP primary circuit. This does not apply to Frame Relay primary circuits.

- A call is designated for the standby circuit.

  The router activates a standby circuit only when the remote router calls the host router over a standby circuit or you activate the circuit manually.

- You activate a standby circuit manually.

Typically, circuits at the remote site will be hot standby circuits, while at the central site, they will be regular standby circuits. Configuring hot standby circuits for the remote router means that the remote router monitors the status of its primary connections, which is easier for the remote router than the central router because there are fewer connections.

Standby circuits support standard demand circuit features such as multilink, unnumbered interfaces, dial optimized routing, and outbound filtering.

Guidelines for Configuring Standby Circuits

A standby circuit must be configured at the central site and at the remote site. To configure a standby circuit, you select a demand circuit then set the Standby Mode parameter to either Hot Standby or Standby. (Refer to Appendix A for parameter descriptions.)

When setting up a standby circuit, follow these guidelines:

- Configure one side of the connection to initiate calls (the hot standby circuit). This is the outgoing side of the connection.
- Configure one side of the connection to receive calls (the standby circuit). This is the incoming side of the connection.

Note: If the standby circuit is part of a bandwidth-on-demand configuration, the outgoing side should be the *monitor* router, and the incoming side should be the *non-monitor* router.

- If you configure routing protocols on the standby circuit, the Inactivity Timeout parameter does not work. Once the router brings up the standby circuit, the routing protocols keep the connection active.
- Configure the Time of Day schedules and the failback timers only on the hot standby side of the connection.
- Use CHAP or PAP as the authentication protocol for the circuit.
- If you want to use unnumbered interfaces, configure them on the outgoing hot standby circuit, and configure unnumbered demand circuit groups on the incoming standby circuit.

To configure standby circuits, refer to Chapter 9.

Balancing Traffic between a Primary Circuit and a Hot Standby Circuit

Once a hot standby circuit is active, the routing protocol activates and finds an alternative route to the destination. When the primary circuit recovers and resumes data transmission, the routing protocol deactivates. This is referred to as a *failback* to the primary circuit.

You can control the failback to the primary circuit manually or automatically. One advantage of controlling failback is that you can delay the return of traffic to the primary circuit. This lets the primary circuit stabilize before it resumes transmission of critical data.

The following configuration choices enable you to manage traffic between the primary circuit and the hot standby circuit:

- RIP or OSPF precedence and cost parameters

  The router sends traffic across the circuit with the better cost route. If the better route is the hot standby circuit, traffic continues across this circuit even if the primary circuit recovers. Conversely, traffic will resume across the primary circuit if that is the better route. Refer to *Configuring IP Services* for information about RIP and OSPF.

- Standby Failback Mode parameter

  This parameter specifies the method that the router uses to deactivate the standby circuit and return to the primary circuit. Using this parameter, you can control the failback to the primary circuit automatically or manually.

- Failback Time parameter

  This parameter specifies the delay before returning to the recovered primary circuit. The routing-level configuration takes precedence over the value of this parameter. If the primary circuit has a better cost route, traffic returns to the primary circuit, regardless of the delay specified by this parameter. If the hot standby circuit has a better cost route, the router uses this circuit until the failback timer expires.

Using Schedules to Manage Standby Circuit Availability

Part of the standby circuit configuration is to schedule the circuit's availability. The Time of Day schedule defines the interval that the standby circuit is available. It also determines how the router uses the primary and standby circuits when they are both active.

You may configure several Time of Day schedules for a circuit in a 24-hour period. If you do not set up a schedule for the circuit, the circuit's availability defaults to 24 hours a day.

The Failback Time parameter is part of the Time of Day schedule. Depending on how you set this parameter, there may be a delay between the time the standby circuit is disconnected and the time traffic returns to the primary circuit. Therefore, it is important to balance the use of the primary and standby circuits to ensure that data reaches the remote destination.

Be aware that the router monitors the primary circuit during the failback time. If the primary circuit fails, the router continues to use the standby circuit.

To configure a circuit's schedule, refer to Chapter 9.

Configuring Multiple Time of Day Schedules

Configuring multiple Time of Day schedules for a circuit can cause schedule conflicts. This section provides two examples of when this happens.

If the failback time for the active Time of Day schedule overlaps the failback time of the next schedule, the router uses the failback time of the latter schedule. The router deducts the amount of failback time already elapsed from the latter schedule (refer to "Example 1: Failback Times That Overlap").

Table 5-1 shows the Time of Day schedule for Standby Circuit 1.

Table 5-1. Time of Day Schedules for Standby Circuit 1

Time of Day Schedule 1	Time of Day Schedule 2	Time of Day Schedule 3
Start Time: 8 a.m. End Time: 11 a.m.	Start Time: 11 a.m. End Time: 5 p.m.	Start Time: 7 p.m. End Time: 11 p.m.
Failback Time: 60 minutes	Failback Time: 10 minutes	Failback Time: 10 minutes

Example 1: Failback Times That Overlap

7:00 a.m.	The primary circuit fails.
8:00 a.m.	The standby circuit becomes available.
10:30 a.m.	The primary circuit recovers and the failback timer starts counting down from 60 minutes. Data is still traveling over the standby circuit.
11:00 a.m.	Since 10:30 a.m., 30 minutes of failback time have elapsed for Time of Day Schedule 1, but Time of Day Schedule 2 is now active. This new schedule has a failback time of 10 minutes, which supersedes the previous failback time of 60 minutes. Because 10 minutes have passed, data traffic returns to the primary circuit.

If you schedule the standby circuit to terminate before the failback time expires, the router still terminates the standby circuit. The router does not wait for the primary circuit to recover. There is no circuit available until the primary circuit reactivates or the standby circuit is available again (refer to "Example 2: Failback Time Results in No Available Circuit").

Example 2: Failback Time Results in No Available Circuit

3:00 p.m.	The primary circuit fails and a standby circuit is activated, as specified in Time of Day Schedule 2.
4:55 p.m.	The primary circuit recovers. The failback timer starts counting down from 10 minutes.
5:00 p.m.	After 5 minutes, Time of Day schedule 3 is active. The standby circuit is brought down and will not be available until 7:00 p.m. For 5 minutes, there is no circuit available to transmit data.
5:05 p.m.	Data traffic transfers back to the primary circuit.

Callback

Callback is a dial-on-demand feature for use between two peer routers, such as a central router and a remote router, over a PPP circuit. You cannot use callback with Frame Relay demand circuits or demand circuit groups.

With this feature, you can configure a router to call back an incoming caller. You can configure callback across any demand circuit, including those configured for bandwidth-on-demand service.

Callback offers the following advantages:

- Reduces tariffs because you can place calls using the lowest cost path
- Secures access for authorized callers only
- Consolidates accounting of phone charges

Figure 5-1 shows how callback works.

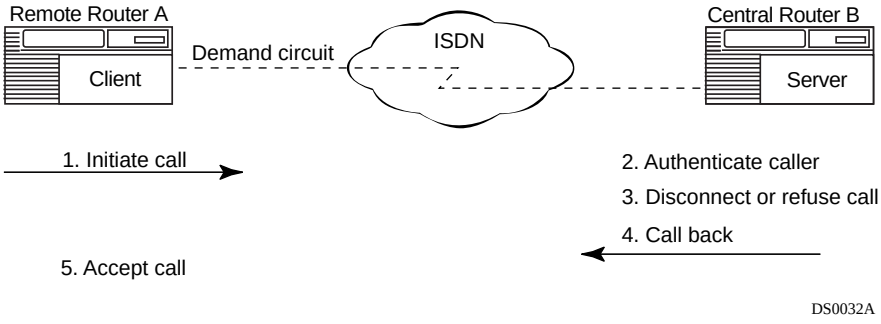


Figure 5-1. Example of Callback over a Demand Circuit

Remote Router A places a call to Central Router B. Router B determines whether the caller is authorized and, if so, terminates the initial call. Router B then places a return call to Router A.

Configuring Callback

Callback operates on a per-demand-=circuit basis. You enable callback by configuring the Callback Mode parameter in the PPP Demand Circuits window. This parameter assigns each end of a callback circuit the role of *server* or *client*. If you do not want to use the callback feature, you accept the default callback mode, Inactive.

The server responds to each incoming call from the client, and either authenticates the call using CHAP or PAP or identifies the caller using the incoming filtering feature. The server disconnects or refuses the call, then redials the client using one of the following options:

- The outgoing phone list

  The outgoing phone list is a user-defined list containing phone numbers of remote routers. Each number in the outgoing phone list is associated with a specific circuit.

- Caller ID, also called Automatic Numbering Identification (ANI)

  Caller ID is an ISDN service that you must purchase from your ISDN service provider. When you purchase this service, the phone number of the caller is placed in the call setup message.Your network switch must also support caller ID.

After placing the initial call, the client waits for a return call from the server. A user-specified parameter determines how long the client waits for a response. During this time, the client will not place an outgoing call to any other destination.

To set the callback configuration parameters, refer to Chapter 9.

Modifying the Callback Mode Parameter

If you modify the Callback Mode parameter, be aware of the following:

- The server or client delay time resets.

  If you change from a server mode to a client mode, or from a client mode to a server mode, the associated callback delay time resets to its default value.

  For example, if you change the callback mode from Server to Client, and the Callback Server Delay Time was set to 5 seconds, this time resets to the default value of 0. Conversely, if you change the callback mode from Client One Charge to Server One Charge, the Callback Client Delay Time resets to its default value of 5 seconds.

- Site Manager prompts you to enable incoming call filtering.

  If you select Server One Charge or Server One Charge Call ID, Site Manager prompts you to enable the Incoming Filter parameter. For these two callback modes, the router uses incoming call filtering to verify that the client is an authorized caller. If you later change these modes to any other callback mode, Site Manager prompts you to disable incoming call filtering.

- Site Manager requests caller resolution table information.

  If you select Server, Server Call ID, Client, or Client One Charge, Site Manager prompts you to make a caller resolution table entry by displaying the Caller Resolution Info window. These callback modes require a caller resolution table entry to authenticate callers on each side of the connection and, for the server, to indicate which circuit to activate for a call.

- Site Manager requests an outgoing phone number.

  If you select Server or Server One Charge, and there are no entries in the outgoing phone list, Site Manager prompts you to enter a phone number by displaying the Outgoing Phone Number window.

Callback and the Circuit's Connection Mode

The server's callback configuration takes precedence over its Connection Mode parameter setting. The Connection Mode parameter determines whether or not a router can place a call. If you enable callback, the router ignores the Connection Mode parameter to ensure that the server can always call the client.

Using the Incoming Phone List for Callback Service

If the callback mode of your router is Server One Charge or Server One Charge Call ID, the router uses incoming call filtering to identify the client, not PPP authentication, which relies on the caller resolution table. Using incoming call filtering, the router can maintain security while refusing the initial call from the client. This saves the client phone charges. To enable incoming call filtering, refer to Chapter 8.

When the server uses incoming filtering, it relies on the incoming phone number to identify the client. When the server receives the call from the client, it matches the client's phone number with a phone number and circuit number in the incoming phone list. The circuit number, specified in the Callback Demand Circuit Name parameter, identifies the circuit that the server uses to place the outgoing call back to the client.

The Callback Demand Circuit Name parameter is located in the Incoming Phone List window. Refer to Chapter 12 for configuration instructions.

Demand Circuit Groups

A demand circuit group is a set of demand circuits that share the same user-defined, unnumbered protocol configuration. An unnumbered protocol configuration does not restrict the router to a specific destination address. Instead, it enables the router to use any circuit in the group for an incoming call, eliminating the need to configure a unique demand circuit for each remote node in the network. One demand circuit group supports many remote routers, thereby reducing the configuration tasks for a large network.

Demand Pools and Demand Circuit Groups

Like individual demand circuits, a demand circuit group is associated with an existing demand pool. The number of circuits in the demand circuit group must be less than or equal to the number of lines in the demand pool. If you change the number of lines in a demand pool, you must increase or decrease the number of demand circuits in the group accordingly.

When the router activates a line from the demand pool, the circuits in a demand circuit group also become available. The router does not bring up the circuits until it receives an incoming call. Demand circuit groups can only receive calls.

A circuit group can use more than one demand pool. This enables the router to use one configuration for circuits across the router's slots because demand pools cannot use lines from different slots.

Each demand circuit group has its own ID. This number is distinct from the demand pool ID that identifies the line pool. Both individual demand circuits and demand circuit groups can use the same demand pool.

Caller Resolution for Demand Circuit Groups

Like individual demand circuits, demand circuit groups use either PAP or CHAP to identify who is calling the router and to determine which circuit group to activate. You can enable either of these authentication protocols on only one side of the link (*one-way authentication)* or on both sides of the link (*two-way authentication*). For information about authentication, refer to Chapter 4.

Depending on a network's security requirements, each remote router can have a unique CHAP name or PAP ID, or they can use the same name. For each remote caller using a unique name or ID, you assign a demand circuit group in the caller resolution table (referred to as the *local group* in Site Manager). The remote callers may use the same local group.

When the router authenticates an incoming call, it receives the caller's name or ID in the CHAP challenge or PAP authenticate request message. The router verifies the caller's identity, then looks up the assigned local group in the table. From this group, the router selects an available circuit and activates the unnumbered protocol configuration over that circuit.

To simplify configuration, the caller resolution table may contain the same PAP ID or CHAP name for all remote routers in the network. In this case, the table has only one entry consisting of the caller name and the local group.

A router configured with demand circuit groups does not initiate connections for the group; the remote side of the connection must place the call first. Consequently, you do not need to configure the CHAP local name and secret or the PAP ID and password for a call request.

Note: The caller resolution table cannot contain individual demand circuits and demand circuit groups for the same caller name.

For added network security, each remote router can have a unique PAP ID or CHAP name but use the same demand circuit group. In this case, the router verifies the remote router's name in the incoming call setup message. If it does not match a name in the caller resolution table, the router disconnects the call.

Protocol Configuration for Demand Circuit Groups

You must configure a demand circuit group using one of the following unnumbered protocols:

- IP with either RIP, RIP II, or OSPF as the routing protocol
- IPX with RIP, SAP, and/or NLSP as the routing protocol
- Bridging

Note: When you configure a protocol for a demand circuit group, Site Manager requires that you also configure a routing protocol.

A single protocol configuration applies to all circuits in the group and can be used by many remote nodes calling the recovery router.

Without the use of specific network addresses, the recovery router must use routing updates to determine the data path to the remote nodes. Unlike individual demand circuits, you can enable routing protocols for a demand circuit group without establishing a dial-up connection. The demand circuit group and its protocol interface are active only when the physical connection is active. Without a physical line available, no circuit or protocol information (for example, RIP update packets) can pass from one router to the next.

Using Demand Circuit Groups with Dial Backup Service

You can use demand circuit groups with dial backup service to dial an alternative site if the original destination cannot be reached. For information about using demand circuit groups and dial backup, refer to Chapter 6.

RADIUS Authentication Services for Demand Circuit Groups

As networks grow to accommodate more remote users, network security and billing become more difficult to manage. RADIUS is an Internet draft specification that solves these issues by centralizing security and accounting information. Centralizing these services improves security and provides a solution that can adapt to the changing size and needs of the remote user and service providers.

In a RADIUS application, there is a client and a server. The router is the RADIUS client. You can only configure RADIUS authentication for incoming calls that use unnumbered protocol interfaces in a demand circuit group configuration. Demand circuit groups work well with RADIUS configurations because they simplify configuration for large numbers of remote users. The unnumbered protocol configuration enables the incoming call to use any available circuit, so many remote users can place calls, even if their number exceeds the number of configured circuits.

For detailed information about RADIUS, refer to *Configuring RADIUS.*

Managing Broadcast Traffic over Demand Circuits

Many of the routing protocols that you can select for a demand circuit send update packets out to the network. Update packets maintain routing tables and gather information about network resources. For dial-on-demand, the frequency of these update packets forces the dial-up connection to remain activated (unless you configure a time of day to deactivate it). When routers exchange update packets, the physical connection is established, unless you create a filter.

To reduce this type of traffic, you can configure one of the following:

- Static routes
- Dial optimized routing
- RIP triggered updates and broadcast timers (for IP)
- RIP and SAP broadcast timers (for IPX)
- Traffic filters

Each method is described in the sections that follow.

Static Routes

You need to configure the demand circuit protocols so they do not send broadcast messages to the network. Once you disable broadcast messages, the router must determine the destination address using a static route.

A *static route* specifies the transmission path that data must follow to another network. This path is based on the destination address of the data. Protocols that can use static routes include

- AURP
- DECnet
- DLSw
- IP
- IPX
- XNS

Demand circuits require static routes if you disable the circuit's routing update protocols. To configure a static route, you need to specify in the protocol's routing table the address of the network to which you will be sending data. The address must be unique to that circuit. For more information about static routes for each of these protocols, refer to the appropriate protocol manual.

Dial Optimized Routing

Dial optimized routing lets you exchange IP RIP and IPX RIP/SAP routing updates only when a connection is active. By limiting when the router sends updates, dial optimized routing reduces the number of connections as well as line costs.

For each dial-on-demand circuit, you have the choice of enabling dial optimized routing. If you enable dial optimized routing, the router establishes a demand connection only for outbound data packets, or if it receives a request from the protocol. The presence of IP RIP and IPX RIP/SAP packets alone will not trigger a dial connection. If you disable dial optimized routing, any packet can initiate demand connections.

To configure dial optimized routing, refer to Chapter 9.

Version 11.0 supports dial optimized routing only for IP and IPX. For all other protocols, the router activates a demand connection for any type of routing packet, regardless of whether you enable dial optimized routing. To avoid this problem, you can configure traffic filters that prevent specific types of packets from activating a connection. Refer to *Configuring Traffic Filters and Protocol Prioritization* for information about configuring filters.

What Happens When You Enable Dial Optimized Routing

The router activates a demand connection when there is data to send. The router then alerts IP and IPX that a connection is active and that they can broadcast routing updates. IP and IPX can also send triggered updates, if any occur while the connection is active.

The connection remains active for the time you specify in the Minimum Duration Time parameter. This timer specifies the minimum amount of time the connection is active. The timer must be set long enough to send complete routing updates to the remote routers. The inactivity time, which starts at the same time as the minimum duration timer, determines how long the connection remains active by monitoring data inactivity. When there is no more data transmitting, the inactivity time expires and the router deactivates the connection.

If you enable or disable dial optimized routing dynamically while your demand connection is active, the router deactivates the connection. If there is still data to send after the call is cleared, the router places another call using the new configuration for the dial optimized routing feature.

Enabling Dial Optimized Routing for Frame Relay Demand Circuits

When you enable dial optimized routing for Frame Relay demand circuits, you must also set the Routing Update Hold Time parameter. This parameter instructs the router to wait for an active connection to the destination device before sending RIP or SAP routing updates.

This timer is necessary if the UNI between the router and the switch is a dynamic UNI, which means that the router learns the PVCs when it calls the Frame Relay switch. The router contacts the switch for the first time using a statically configured PVC. If the router sends routing updates over the static PVC, they will not go over the PVCs that connect to the destination. By setting the Routing Update Hold Time to a large enough value, you ensure the updates are sent to the destination.

Exceptions for Sending Routing Updates

Routing updates are sent independent of data transmission when

- An IP or IPX interface becomes active for the first time.

  When an IP or IPX interface first initializes, it sends routing updates to every node in the network. If there is no data to send, the connection expires in the time you specify in the Minimum Duration Time parameter.

- The RIP Broadcast Timer (IP) or RIP/SAP Update Interval (IPX) expires.

  Each time the broadcast timer or update interval expires, the protocol can request to send updates over an active connection. If you enable dial optimized routing, the value of the timer defaults to a high value so that connections are infrequent. Reducing the value of the broadcast timer or update interval defeats the purpose of dial optimized routing.

  If a connection is made because there is data to send, the router uses this opportunity to send routing updates. Consequently, these timers reset instead of expiring. This further reduces the frequency of connections made by a protocol request.

Maintaining the Routing Table

Although dial optimized routing limits the amount of routing information sent across the network, you can maintain the accuracy of the routing tables using the following methods:

- Set the Hold Down Timer parameter to a higher value than the Broadcast Timer or Update Interval parameter.

  The Hold Down Timer parameter specifies how long unusable routes are advertised after the route is invalid. This ensures that unreachable routes remain in the routing table long enough to be broadcast over an active connection.

- Synchronize protocol requests for a connection.

  When a connection is active, the router sends status messages to IP or IPX, alerting the protocol that it can send routing updates. If IP or IPX does not receive this connection message, it makes a separate request for a connection. This request resets the Minimum Duration Time parameter and the connection then remains active for the specified time.

- Configure the router to handle oversubscription of lines.

  If you do not have enough lines to accommodate the number of circuits, you can enable an oversubscription timer. This timer determines how often the router retries a connection so it can send routing updates if the previous attempt failed. The router keeps a list of circuits requesting connections and tries to establish these connections when the timer expires.

  To configure the oversubscription timer, you must use the Technician Interface; you cannot do this using Site Manager. The attribute entry is wfSwservOptsEntry.wfSwservOptsOverSubRetryTimer. The default value is two minutes; the maximum value is 1440 minutes.

Refer to *Configuring IP Services* for information about RIP and *Configuring IPX Services* for information about RIP/SAP.

IP RIP Triggered Updates and Broadcast Timers

To prevent broadcast messages from keeping the demand circuit active, you can configure the RIP broadcast timer and triggered updates.

The broadcast timer lets you configure how often the router sends routing updates to the network. Unlike the broadcast timer, triggered updates are sent immediately after the router detects a routing change in the network.

If you set the broadcast timer to a high value, for example, several hours, and you enable triggered updates, you limit the frequency of broadcast traffic while maintaining the accuracy of the routing tables. By limiting broadcast traffic, you prevent the demand circuit from remaining active unnecessarily.

For more information about these RIP features, refer to *Configuring IP Services.*

IPX RIP and SAP Broadcast Timers

To prevent broadcast messages from keeping the demand circuit active, you can configure RIP and SAP broadcast timers for IPX transmission. RIP and SAP broadcast timers enable you to control how often update transmissions occur. You can even eliminate RIP and SAP broadcasts entirely. By controlling broadcast traffic, you can prevent the demand circuit from remaining active unnecessarily.

For more information about broadcast timers, refer to *Configuring IPX Services*.

Traffic Filters

To prevent routing updates and protocol-specific messages from keeping the circuit active, you can configure traffic filters that specify which packets are permitted across an established dial-up line and which packets are prevented from activating a dial-up line.

Traffic filters enable the router to selectively relay or drop a packet, frame, or datagram, based on standard protocol fields or user-defined fields.

If you implement inbound filters, the router drops unwanted packets at the interface where it receives data. By filtering incoming data, you can prevent unwanted packets from going to the destination interface.

If you implement outbound filters, the router drops unwanted packets before dialing a line. The router continues to filter the data so that unwanted packets do not keep the circuit active.

You can also filter outbound packets to prevent the inactivity time from resetting. For example, RIP packets can always be sent, but if no other data is sent, the inactivity time expires and the line is deactivated.

To configure traffic filters, see *Configuring Traffic Filters and Protocol Prioritization.*

Data Compression

Site Manager allows you to configure the Bay Networks proprietary data compression protocol, WCP, over any PPP demand circuit. Enabling compression improves bandwidth efficiency by eliminating redundant strings in data streams. This, in turn, improves network response times and yields line-cost savings.

To implement data compression, you must open the appropriate demand circuits window. Once a demand circuit exists, you will see a Protocols button in the window's top left corner. WCP is one of the protocols you can choose. Note that WCP does not work with any other router's compression protocol. Refer to Chapter 9 for more specific instructions on how to configure protocols.

To learn more about data compression, see *Configuring Data Compression Services.*

PPP Multilink

Multilink is a feature of PPP that you can enable for individual PPP links. Links are logical communication channels between two routers. A typical link includes one ISDN B channel, one dial-up modem connection, and a leased T1 line.

Multilink is important for demand circuits that use bandwidth-on-demand service because it enables you to

- Group lines of different speeds
- Distribute traffic more evenly among the lines
- Restore packet sequence
- Monitor traffic volume (for bandwidth-on-demand service)

These features enable the router to add bandwidth to relieve a congested demand circuit.

When you enable multilink, you can combine a set of lines between two routers into a single *bundle*. Each bundle belongs to a separate circuit. Multilink distributes traffic over each logical line in a bundle in an amount proportional to the bandwidth of the link. Once data reaches the destination router, multilink resequences packets arriving on different lines.

For ISDN lines, you can manage the allocation of bandwidth in a multilink bundle by enabling the PPP Bandwidth Allocation Protocol (BAP). For more information about this protocol, refer to Chapter 7.

Protocol Prioritization

When you configure a router, you can prioritize the different types of traffic sent across a synchronous line. This process is called *protocol prioritization*. Being able to prioritize traffic is important for your time-sensitive applications.

For example, a user at Router A participating in a Telnet session with Router B requires a more immediate response than a user at Router A performing a file transfer with Router B.

When you configure a demand circuit, the router automatically enables protocol prioritization because PPP requires priority for control messages.

Although protocol prioritization is set automatically, you still need to configure priorities and filters. For more information about protocol prioritization, see *Configuring Traffic Filters and Protocol Prioritization*.

Note: Do not configure protocol prioritization for circuits running PPP multilink, for example, secondary dial-up circuits supporting a congested demand circuit.

Chapter 6
Dial Backup Implementation Notes

This chapter describes Bay Networks implementation of dial backup service. Most of these notes apply only to circuit backup; that is, they apply only to a primary Bay Networks Standard, PPP, or Frame Relay PVC. Data compression is the only feature that you can use with circuit and link backup.

Data Compression

Site Manager allows you to configure Bay Networks proprietary data compression protocol, WCP, over any PPP or Frame Relay primary and backup circuit.

Enabling data compression improves bandwidth efficiency by eliminating redundant strings in data streams. This, in turn, improves network response times and yields line-cost savings.

To implement data compression, you must enable WCP on the leased circuit that you selected before configuring the backup pools.

For more information about data compression, see *Configuring Data Compression Services.*

Defining the Role of the Router in the Network

When you configure a router for dial backup, you must specify whether the router initiates calls or waits to receive calls. The router placing the backup call waits until the primary circuit fails. The other router then waits for the call without trying to initiate one. If you do not specify the role of each router, they try to call one another simultaneously and each router receives a busy signal.

You define the role of a router using the Backup Mode parameter, which is part of the primary circuit configuration (see Chapter 10). Do not specify the same value for both sides of the circuit.

Bandwidth for Backup Circuits

Time-sensitive protocols or interactive protocols (for example, Telnet) may not function correctly over a backup circuit that has less bandwidth than the primary circuit. When user-response time is critical, backup circuits require the same bandwidth as the primary circuits.

Using Unnumbered Interfaces to Dial an Alternative Site

IP unnumbered interfaces define a point-to-point connection for which you do not configure a specific IP address, for example, 128.185.35.70. Instead, you configure an address of 0.0.0.0. Unnumbered interfaces are useful because the router is no longer restricted to a specific IP destination address. This gives the router the flexibility to dial another site if it cannot reach the original destination.

If you configure unnumbered IP over a PPP primary circuit, and the connection to the destination router fails, the local router automatically dials each phone number in the outgoing phone list until it successfully connects to another router.

You can also configure unnumbered interfaces for IPX and bridging; however, the sample network that follows describes only IP to simplify the example. For more information about unnumbered interfaces, refer to *Configuring IP Services*, *Configuring IPX Services*, or *Configuring Bridging Services.*

Sample Network Using Unnumbered Interfaces

Figure 6-1 shows a sample network using IP unnumbered interfaces and dial backup service. Router A, the remote router, connects to Router B, the regional router, via a primary leased line. Router B connects to Router C, the central router, via a regular leased line, that is, a leased line without dial backup service.

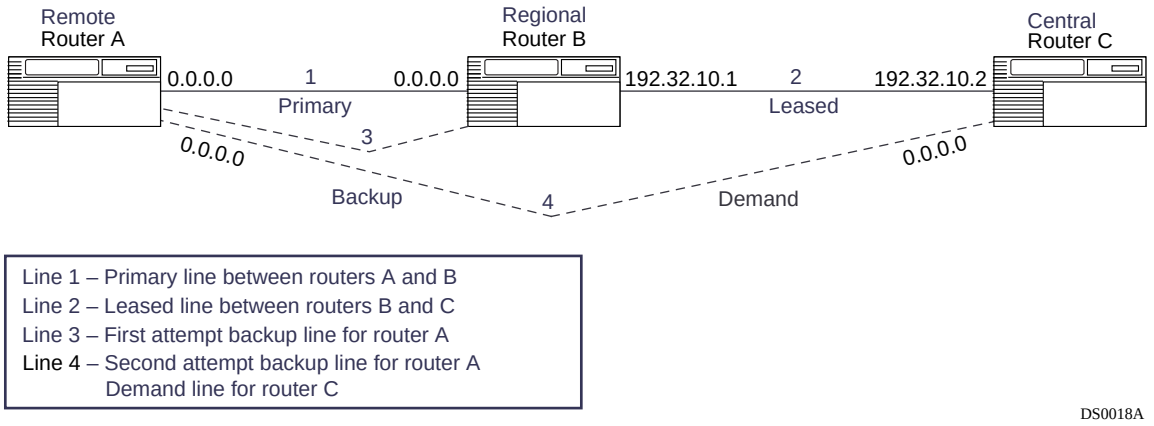


Figure 6-1. Dialing an Alternative Router Using IP Unnumbered Interfaces

If the primary connection between Routers A and B goes down, the backup circuit takes over, adopting the configuration of the primary circuit. The backup circuit tries to call Router B, but it cannot establish a connection.

Because you configure unnumbered IP addresses on the primary circuit, Router A is not limited to calling Router B. Router A dials the next phone number in its outgoing phone list, Router C's phone number, and makes a connection.

For Router A to dial Router C, configure the routers as shown in Table 6-1.

Table 6-1. Configuration Requirements for Routers A and C

Router A	Router C
Configure an unnumbered PPP primary circuit	Configure a demand pool with unnumbered demand circuits
Configure routing protocols for the primary circuit	Configure routing protocols on the demand circuit to match Router A's routing protocol configuration for the primary circuit
N/A	Set Connection Mode parameter to No Dial
Include CHAP Local Name/CHAP Secret or PAP Local ID/ PAP Password for the primary circuit	Configure the caller resolution table to include Router A's CHAP Name/CHAP Secret or PAP ID/PAP Password

Simplifying Unnumbered Configurations with Demand Circuit Groups

You can simplify configurations for large networks by using a demand circuit group and dial backup service.

A demand circuit group is a set of demand circuits that share the same user-defined unnumbered protocol configuration. An unnumbered protocol configuration does not restrict the router to a specific destination address. Instead, it enables the router to use any circuit in the group for an incoming call, eliminating the need to configure a unique demand circuit for each remote router in the network. One demand circuit group supports many remote routers, thereby reducing the configuration tasks for a large network.

Refer to Chapter 5 for a detailed description of demand circuit groups.

Sample Network Using Demand Circuit Groups

Figure 6-2 shows a sample network using demand circuit groups. Router 1 is a regional router that supports hundreds of remote routers. Router 5 serves as a recovery router for several branch offices if Router 1 fails.

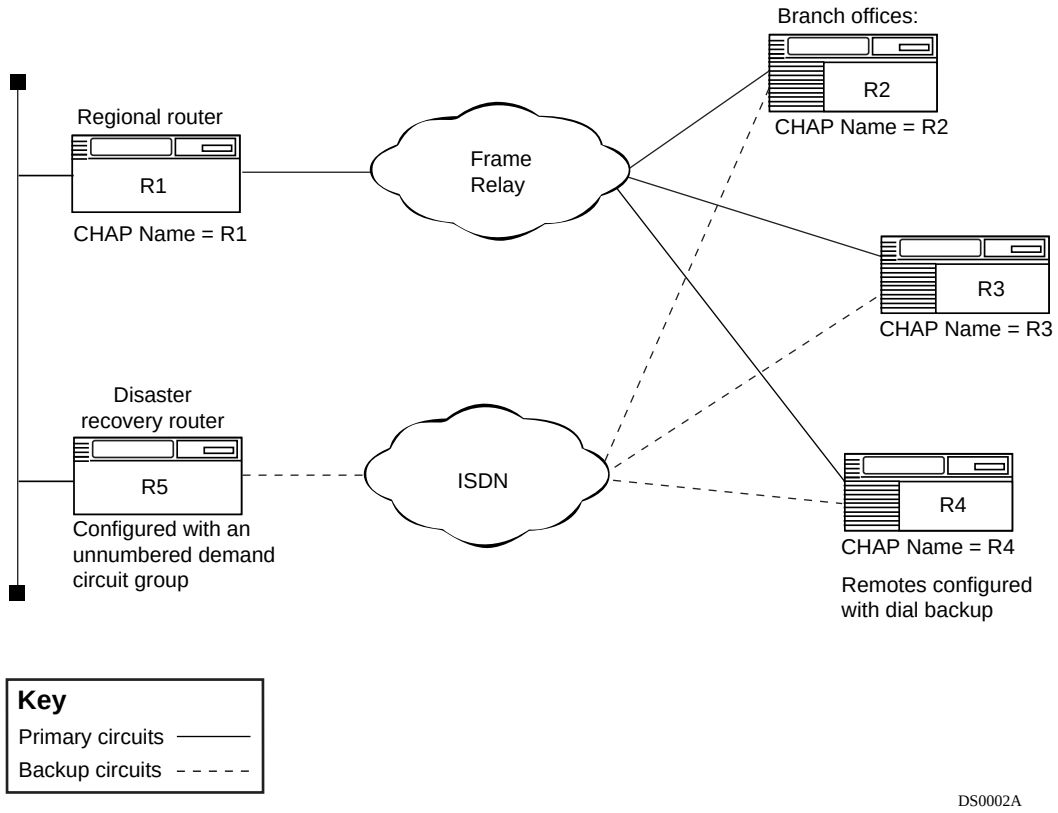


Figure 6-2. Dialing an Alternative Router Using Demand Circuit Groups

This type of network is ideal for a demand circuit group because it supports many nodes. If you were to configure each circuit individually, the task of backing up each remote router would be difficult. By using demand circuit groups, however, you need only one configuration on the disaster recovery router to support many remote sites.

The configuration for this type of network is as follows:

- The branch offices are configured for dial backup and are connected directly to the regional router. They determine if the connection to the regional router fails and, if so, invoke the dial backup connection.
- The circuits on Router 5, the recovery router, are configured as a demand circuit group, consisting of three circuits. (Router 5 uses an existing demand pool for the demand circuit group.) These circuits accept calls from the remote routers configured for dial backup.

  The Connection Mode parameter for the circuits in the demand circuit group is set to No Dial because the recovery router does not initiate connections. The remote router must establish the connection first.
- Router 5's caller resolution table contains entries for Routers 2, 3, and 4. Each entry specifies the same demand circuit group.

In the example, if one of the branch offices detects a failure of the regional router's primary line, it attempts to activate a dial backup connection by placing a call to the recovery router. The number of branch offices that successfully connect to the recovery router depends on the number of circuits in the demand circuit group. Once the connection is made, data can continue across the network.

Note: Demand circuit groups only work with PPP. You cannot use them in a network where the dial backup circuits are using Frame Relay.

Chapter 7
Bandwidth-on-Demand Implementation Notes

This chapter describes Bay Networks implementation of bandwidth-on-demand service.

Bandwidth-on-Demand Terminology

Table 7-1 lists the terminology that Site Manager and this manual use to refer to circuits in a bandwidth-on-demand configuration.

Table 7-1. Terminology for Bandwidth-on-Demand Service

Type of Circuit	Referred to As
Leased circuit Leased multilink circuit	Bandwidth circuit You designate a leased circuit as a bandwidth circuit to enable bandwidth-on-demand service.
Dial-on-demand circuit	Demand circuit This is a demand circuit for which you can provide bandwidth-on-demand service. You do not designate this as a bandwidth circuit.
Dial-up circuit that helps the congested leased circuit	Dial-up or secondary circuit

PPP Multilink

Multilink is a feature of PPP that you can enable for individual PPP links. Site Manager automatically configures PPP multilink when you configure circuits for bandwidth-on-demand service.

Links are logical communication channels between two routers. A typical link includes two ISDN B channels, one dial-up modem connection, and a leased 64 Kb/s line. Multilink enables you to

- Group lines of different speeds
- Distribute traffic more evenly among the lines
- Maintain packet sequence
- Monitor traffic volume (for bandwidth-on-demand service)

These features are particularly beneficial for bandwidth-on-demand configurations, where the router activates additional dial-up lines to relieve congestion over a single leased line, a leased multilink bundle, or a demand line.

Multilink lets you combine a set of lines between two routers into a single *bundle*, which can consist of up to 30 links of different speeds. The actual number of links in the bundle depends on the hardware platform, total bundle speed, the speed of each link in the bundle, and the type of traffic.

Each bundle belongs to a separate circuit. Multilink distributes traffic over each logical line in a bundle in an amount proportional to the bandwidth of the link.

The router sending the data divides the outbound traffic among all the lines in the bundle. Once data reaches the destination router, multilink reassembles and resequences packets arriving on different lines.

Figure 7-1 shows how multilink and bandwidth-on-demand work together. In this figure, one router is the congestion monitor. This router monitors traffic volume over the bandwidth circuit. If the monitor router detects congestion, it activates an additional line, in this case, an ISDN B channel. If the volume of traffic is still heavy, the monitor router adds more channels until congestion is relieved.

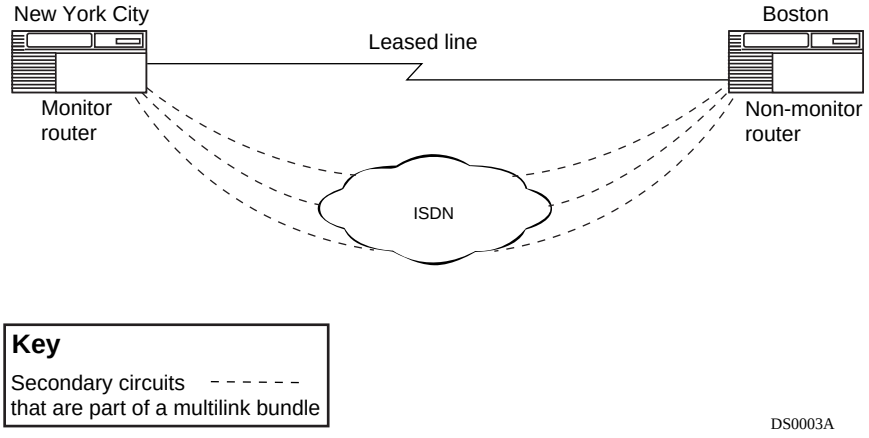


Figure 7-1. Multilink and Bandwidth-on-Demand Operation

For more information about PPP multilink, see *Configuring PPP Services.*

Multilink Fragmentation

Multilink fragmentation splits datagrams into smaller packets when necessary and sends these packets across links in a multilink bundle. Fragmentation improves the distribution of data across multilink lines and uses buffer resources more efficiently, thereby improving communication over bandwidth circuits. Bay Networks routers comply with RFC 1717, which defines PPP multilink.

Packets sent across links in a multilink bundle have an outer header packet that contains a unique packet sequence number and allows for the following:

- Fragmentation of the original packets
- Assignment of sequence numbers to each fragment
- Transmission across links in a multilink bundle
- Reassembly of the original sequence and packet size at the destination router

For more information about multilink and fragmentation, refer to *Configuring PPP Services*.

PPP Bandwidth Allocation Protocol

The PPP Bandwidth Allocation Protocol (BAP), defined in RFC 2125, manages the dynamic allocation of bandwidth across links in a multilink bundle. It provides a flexible yet powerful method of managing bandwidth between two routers.

BAP is only available for bandwidth-on-demand service across ISDN lines.

BAP does the following:

- Coordinates the addition and removal of links from a bundle
- Enables a router to pass information to its peer, so the peer knows which phone number to dial to activate a connection
- Defines call control packets that enable the router to add or remove bandwidth effectively

BAP has the following advantages:

- Ensures effective use of bandwidth.
- Allows the Bay Networks routers to work together or with other vendors' routers.
- Minimizes the configuration of outgoing phone numbers because only one number is required. The peer passes other phone numbers to the router, which the router then uses to make calls.
- Uses call requests to determine whether bandwidth is available, which saves the cost of placing a call to find out this information.

  Call requests are BAP protocol messages and are unrelated to ISDN call requests. When the router sends a BAP call request, it uses active lines, so there is no call attempt and no phone charge.
- Ensures that both routers agree to activate and deactivate the lines, so there are no allocation conflicts.

The Bandwidth Allocation Control Protocol (BACP) is the control protocol. It negotiates the use of BAP, enabling BAP data to be exchanged between the peer routers. If BACP negotiation fails, the router will not use BAP for bandwidth-on-demand service.

How BAP Works

Figure 7-2 shows BAP negotiation between two routers:

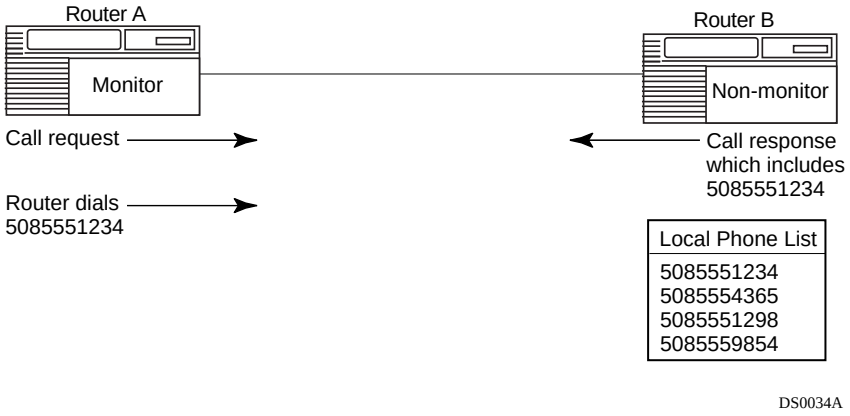


Figure 7-2. BAP Negotiation between Two Routers

In this example, two Bay Networks routers are connected. Router A has only one phone number in its outgoing phone list for the destination, Router B. Router A calls Router B. While they are communicating, Router A, the monitor router, determines that it needs more bandwidth based on the user-defined congestion thresholds. BAP negotiation then begins as follows:

1. Router A sends a call request asking for more bandwidth.
2. Router B, the non-monitor router, checks the router slots to find an available line. It uses the Preferred and Reserved Bandwidth Slot parameters to determine which slots to check first. You can set these parameters for a non-monitor router if the Bandwidth Mode parameter is set to Dynamic Monitor.
3. When it finds an available line, Router B sends a call response that includes the local phone number of the available line.
4. Router A calls the new phone number. Router B then activates the additional line.
5. If the lines become congested again, Router A repeats the process.

If Router B uses all the available phone numbers, and Router A sends another call request for bandwidth, Router B can inform Router A that there are no available lines, saving Router A the cost of calling to make a connection.

When Router A no longer needs the extra bandwidth, it must ask Router B to deactivate the line. Both routers must agree to deactivate the line to prevent one router from keeping the line active while the other tries to deactivate it.

BAP Negotiation with Other Vendors' Routers

If your Bay Networks router communicates with another vendor's router, both routers may be monitoring congestion, regardless of who initiated the call. Bandwidth allocation algorithms or congestion thresholds may not always be the same on both sides of the line. Therefore, both routers must agree to activate or deactivate the line to prevent one side from keeping the line active while the other tries to deactivate it.

Configuring BAP

To use BAP, you must configure bandwidth-on-demand service for single leased lines, leased multilink bundles, or dial-on-demand circuits. Once you have set up bandwidth-on-demand service, you can configure BAP. For configuration instructions, refer to Chapter 11.

You also need to set up a local phone list if your router is responsible for passing phone numbers to its peer router to activate additional lines. To set up a local phone list, refer to Chapter 12.

If you do not configure BAP for your bandwidth connections, the monitor router adds bandwidth without negotiating with the non-monitor router.

Protocol Prioritization

When you configure a router, you can prioritize the different types of traffic sent across a line. This process is called *protocol prioritization.* When you configure leased bandwidth circuits, the router automatically enables protocol prioritization.

PPP multilink automatically enables protocol prioritization, but only for interrupt queuing. You cannot specify filters or priorities. Multilink assigns the highest (that is, interrupt-level) priority to link control packets, giving PPP control messages priority over other types of data while preserving the packet sequencing.

For more information about protocol prioritization, see *Configuring Traffic Filters and Protocol Prioritization.*

Defining the Role of the Router in the Network

Leased bandwidth circuits are point-to-point connections. For each circuit, you must designate a router at one end of the connection as the *congestion monitor.*

The congestion monitor checks the congestion of the lines in a multilink bundle. If this router discovers congestion, it activates secondary lines. The router at the other end of the connection, the *non-monitor router,* does not have the authority to activate a secondary line. Do not set the Bandwidth Mode parameter to the same value for both routers. This will prevent the routers from activating a second line simultaneously.

You define the role of the router using the Bandwidth Mode parameter, which is part of the bandwidth circuit configuration (refer to Chapter 8).

Balancing Traffic between Lines in a Multilink Bundle

With multilink enabled for bandwidth-on-demand service, the router divides the outbound data traffic among all links in the bundle. The external clock speed of each line determines how much of the total traffic each link receives. On the receiving end, multilink resequences packets arriving on different links using the sequence number from the multilink header.

For more information about traffic distribution, see *Configuring PPP Services.*

Ensuring the Accuracy of the Congestion Thresholds

The router uses several congestion threshold parameters to measure congestion on the bandwidth circuit. The values of these parameters determine when the router activates additional lines to relieve congestion.

If you want to change the clock speed of your leased line to a value other than the default, 64 Kb/s, this affects how the router calculates the congestion thresholds. To ensure that the router's calculations are accurate, you must modify the clock speed using the synchronous line parameter External Clock Speed. Once you configure this parameter to match the line speed, you ensure that the congestion thresholds will be correct.

The External Clock Speed parameter is part of the synchronous line configuration. To access synchronous line parameters, begin at the Configuration Manager window and select Circuits > Edit Lines. From here, you can select the circuit that you want to edit.

For instructions on accessing and modifying the synchronous line parameters, refer to *Configuring WAN Line Services*.

Testing the Bandwidth-on-Demand Connection

To ensure that the router can activate a secondary line if a leased line becomes congested, you can use the Technician Interface to execute the **forced dial** command. The **forced dial** command tells the router that the leased line or bundle is congested, even if it is not. This forces the router to activate a secondary line. If the router cannot activate a secondary line, there is a problem with the line.

To issue the **forced dial** command, set the value of the forced dial attribute to 1. The command syntax is as follows:

set wfSwservOptsEntry.wfSwservOptsForcedDial.<*circuit_no***.> 1;commit**

To deactivate a forced dial connection, issue a **forced take down** command. The command syntax is as follows:

set wfSwservOptsEntry.wfSwservOptsForcedTakedown.<*circuit_no***.> 1;commit**

You cannot use this test for demand circuits using bandwidth-on-demand service.

Chapter 8
Customizing Line Pools

This chapter provides instructions on how to modify dial-on-demand, dial backup, and bandwidth-on-demand line pools. You should have already created line pools according to the instructions in Chapter 1.

The procedures for modifying line pools are similar for all three dial services. To avoid repetition, this chapter shows only the dial-on-demand configuration windows as examples. For dial backup or bandwidth-on-demand, the window may have a different title, but the procedure is the same.

Remember these guidelines about line pools:

- When adding lines to a pool, configure all lines in the pool to use the same authentication protocol. You cannot have a pool with one line using CHAP and another using PAP.
- Both individual circuits and demand circuit groups can use demand pools.
- If you plan to configure RADIUS for any dial service, all lines in a line pool must use RADIUS.

Adding Line Pools

You should have already created line pools in Chapter 1. To create additional line pools, refer to Chapter 1.

Changing Pool IDs

Before you can change a pool ID, you must first delete all circuits associated with that pool. Site Manager will not let you modify a pool ID otherwise. Refer to the appropriate circuit customizing chapter to learn how to delete circuits.

To change a pool ID:

1. **Begin at the Configuration Manager window.**
2. **Select Dialup > Demand, Backup, or Bandwidth On Demand Pools.**

   Site Manager displays the Demand, Backup, or Bandwidth-on-Demand Pools window (Figure 8-1).

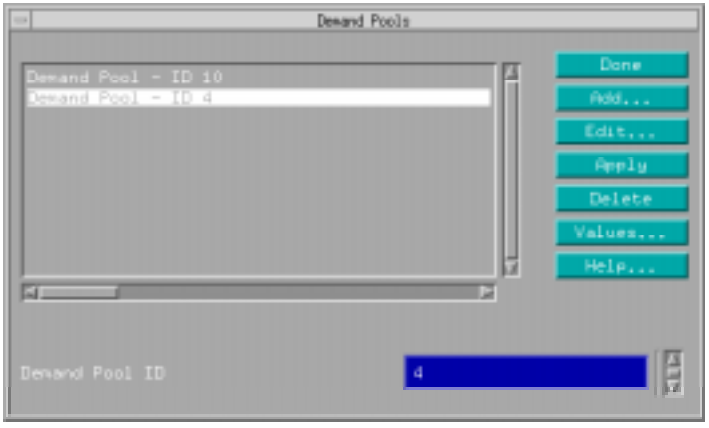


Figure 8-1. Demand Pools Window

3. **Select a pool entry at the top of the window.**
4. **Click in the Pool ID field.**

Site Manager: Demand/Backup/Bandwidth Pool ID parameter: page A-4

5. **Enter a new pool ID and click on Apply.**

   The new pool appears at the top of the window.
6. **Click on Done.**

Deleting Pools

Before you can delete a pool, you must first delete all circuits associated with that pool. Site Manager will not let you delete a pool otherwise. Refer to the appropriate circuit customizing chapter to learn how to delete circuits.

1. **Begin at the Configuration Manager window.**
2. **Select Dialup > Demand, Backup, or Bandwidth On Demand Pools.**

   Site Manager displays the Demand, Backup or Bandwidth On Demand Pools window (refer to Figure 8-1).
3. **Select a pool entry at the top of the window.**
4. **Click on Delete.**

   Site Manager asks if you are sure you want to delete the pool.
5. **Click on OK.**
6. **Click on Done.**

Modifying the WAN Serial Interface Type and Line Media Type

You should have already configured the WAN serial interface type and line media type in Chapter 1.

To modify the WAN serial interface type and the line media type:

1. **Begin at the Configuration Manager window.**
2. **Click on the COM connector whose interface you want to change.**

   The connector name should have a D, B, or W next to it.

   Site Manager displays the Edit Connector window (Figure 8-2).

Figure 8-2. Edit Connector Window

3. **Click on Edit Line.**

   Site Manager displays the Edit SYNC Parameters window.

4. **In the Edit SYNC Parameters window, find and modify the following parameters:**

   - WAN Serial Interface Type

     Change this value from the default, Sync, to Async if you want to use asynchronous PPP across your dial-up lines. If you are already using asynchronous PPP, you can change the type from Async to Sync. Remember that for the BLN and BCN, this parameter is available only on the Octal Sync Link Module.

Site Manager: WAN Serial Interface Type parameter: page A-4

- Sync Media Type (called Line Media Type for dial services)

  Choose Raise DTR, V.25bis, or Hayes. Disregard the other options.

Site Manager: Line Media Type parameter: page A-5

- Cable Type

  Change this value to specify the physical interface to the attached modem or TA.

Site Manager: Cable Type parameter: page A-6

5. **Click on OK.**
6. **Click on Done.**

Modifying Modem Configurations

If your dial application uses modems, you can modify the default modem parameters for each type of modem signaling (Raise DTR, V.25bis, or Hayes).

To modify the modem parameters:

1. **Begin at the Configuration Manager window.**
2. **Click on the COM connector whose modem interface you want to change.**

   The connector name should have a D, B, or W next to it.

   Site Manager displays the Edit Connector window (Figure 8-3).

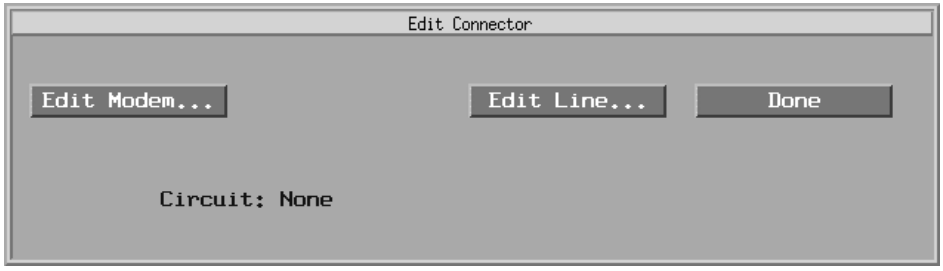


Figure 8-3. Edit Connector Window

3. **Click on Edit Modem.**

   The WAN Serial Interface Type and the Line Media Type parameter values determine which Modem Interface window Site Manager displays (Table 8-1).

Table 8-1. Modem Interface Windows

WAN Serial Interface Type	Line Media Type	Modem Interface Window Displayed
Sync	Raise DTR or V.25bis	Sync Modem Interface (Figure 8-4)
Async	Raise DTR or V.25bis	Async Modem Interface (Figure 8-4)[a]
Async	Hayes	Async Hayes Modem Interface (Figure 8-5)

a. The Async Modem and Sync Modem Interface windows are the same, except for the title.

Figure 8-4. Sync Modem Interface Window

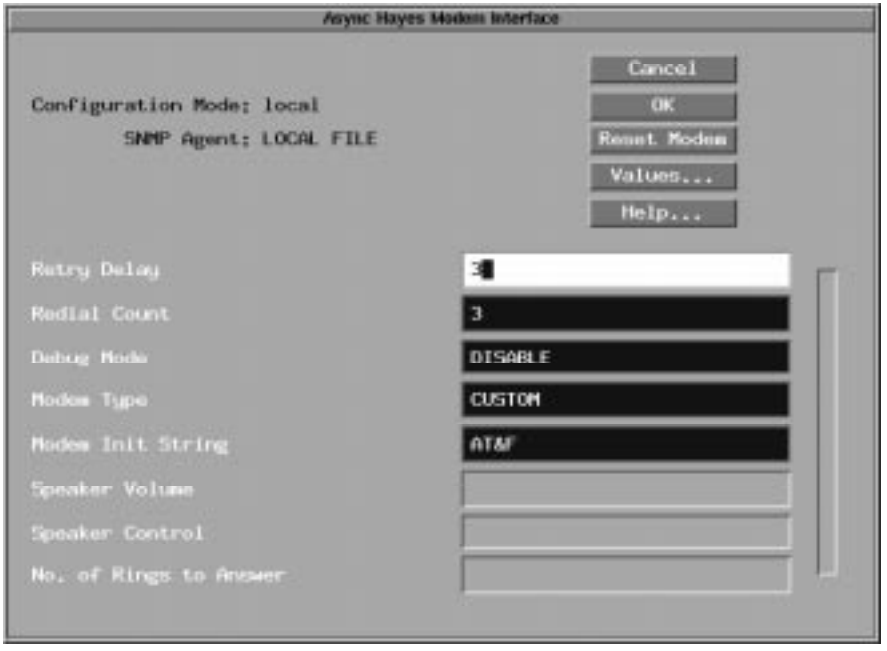


Figure 8-5. Async Hayes Modem Interface Window

The following sections instruct you how to modify your modem configuration.

Selecting a Modem (Hayes only)

For asynchronous interfaces using Hayes signaling, you can specify a particular modem for your network. Refer to "Modifying Modem Configurations" on page 8-6 to access the Modem Interface window.

To select a modem:

1. **Begin at the Async Hayes Modem Interface window (refer to Figure 8-5).**
2. **Specify the modem for your network.**

   Click on Values to display a list of modems. If the modem you are using is not on the list, accept the default, Custom.

Site Manager: Modem Type parameter: page A-8

   If you select a modem from the list, Site Manager automatically supplies the defaults for the Speaker Volume, Speaker Control, and No. of Rings to Answer parameters.

3. **Enter a value for the Modem Init String parameter if you selected Custom for the modem type.**

Site Manager: Modem Init String parameter: page A-9

4. **Optionally, change the modem's speaker volume and control.**

Site Manager: Speaker Volume parameter: page A-10 Site Manager: Speaker Control parameter: page A-10

5. **Optionally, change the number of rings that the router waits for the modem to answer.**

Site Manager: No. of Rings to Answer parameter: page A-11

6. **Click on OK.**

   You return to the Edit Connector window (refer to Figure 8-3).

7. **Click on Done.**

Modifying Modem Initialization Commands

You can change the modem initialization command that the router sends to the modem. Refer to "Modifying Modem Configurations" on page 8-6 to access the Modem Interface window.

To change the modem initialization command:

1. **In the Sync Modem Interface window, change the modem command.**

   This is optional. Raise DTR and V.25bis signaling do not require a modem command.

Site Manager: Modem Command String parameter: page A-9

2. **In the Async Modem Interface or Async Hayes Modem Interface window, modify the modem initialization string.**

   Appendix E lists the modem initialization commands for the ARN.

Site Manager: Modem Init String parameter: page A-9

3. **Click on OK.**

   You return to the Edit Connector window (refer to Figure 8-3).

4. **Click on Done.**

Modifying How the Modem Connects to the Network

You can change how the modem connects to the network. Refer to "Modifying Modem Configurations" on page 8-6 to access the Modem Interface window.

To change how the modem connects to the network:

1. **Modify the amount of time the router waits between connection attempts (sync interfaces, async interfaces, async Hayes interfaces).**

Site Manager: Retry Delay parameter: page A-7

2. **Modify the number of connection attempts the router makes (sync interfaces, async interfaces, async Hayes interfaces).**

Site Manager: Redial Count parameter: page A-7

3. **Enable the Ring Indicator parameter for only Raise DTR interfaces.**

Site Manager: Ring Indicator parameter: page A-7

4. **Enable the Debug Mode parameter to see debug messages that the router logs (sync interfaces, async interfaces, async Hayes interfaces).**

Site Manager: Debug Mode parameter: page A-8

5. **Click on OK.**

   You return to the Edit Connector window (refer to Figure 8-3).

6. **Click on Done.**

Removing a Dial Service from a Modem Line

To remove a dial service from an ISDN line, refer to "Removing B Channels from a Pool" on page 8-27.

To remove a dial service from a modem line:

1. **Begin at the Configuration Manager window.**
2. **Select Dialup > Demand, Backup, or Bandwidth On Demand Pools.**

   Site Manager displays the Pools window (refer to Figure 8-1).
3. **Select the pool entry that you want to modify and click on Edit.**

   Site Manager displays the Lines Definition window (refer to Figure 1-4).
4. **Click on the COM connector to remove the dial service from the line.**

   Site Manager removes the D, B, or W next to the connector name. If this is the only line in the pool, Site Manager also deletes the pool.
5. **Select File > Exit.**

   You return to the Pools window.
6. **Click on Done.**

Caution: If you modify a modem line carrying an active circuit, the router terminates the circuit.

Modifying ISDN Configurations

This section describes how to modify ISDN configurations. You cannot modify the BRI or PRI port application. You must remove the interface and repeat the configuration procedure. To delete these interfaces, refer to "Removing BRI and PRI from the Router" on page 8-28.

Modifying BRI Signaling over the D Channel

The BRI Interface Configuration window defines the signaling over the D channel. In most cases, the defaults for BRI will work for your network; however, you can edit the parameters.

To edit the BRI:

1. **Begin at the Configuration Manager window.**
2. **Click on a configured ISDN connector.**

   Site Manager displays the ISDN Dialup window (Figure 8-6).

Figure 8-6. ISDN Dialup Window

3. **Click on Edit D Chan.**

   Site Manager displays the BRI Interface Configuration window (Figure 8-7).

Figure 8-7. BRI Interface Configuration Window

4. **Edit the BRI parameters according to the parameter descriptions in Appendix A.**
5. **Click on OK.**
6. **Click on Done.**

Modifying the MCT1 and MCE1 Port Configurations

The defaults for the port parameters work for most configurations; however, you can modify the physical interface of the MCT1 and MCE1 ports, as follows:

1. **Begin at the Configuration Manager window.**
2. **Click on an MCT1 or MCE1 connector.**

   Site Manager displays the PRI Logical Lines window (Figure 8-8).

Figure 8-8. PRI Logical Lines Window

3. **Click on Port Details.**

   Site Manager displays the Port Parameters window (refer to Figure 1-10).

4. **Modify the parameters according to the descriptions in *Configuring WAN Line Services*.**
5. **Click on OK.**

   You return to the PRI Logical Lines window.

6. **Click on Apply to save the changes.**
7. **Click on Done.**

Changing PRI Timeslots

For most networks, you have configured all of the available B channels for PRI service. (Refer to "Configuring PRI Lines" in Chapter 1.) If you have purchased selective PRI service, you can modify the number of individual B channels for the interface.

To modify individual PRI timeslots:

1. **Begin at the Configuration Manager window.**
2. **Click on an MCT1 or MCE1 connector.**

   Site Manager displays the PRI Logical Lines window (refer to Figure 8-8).
3. **Click on a B channel.**

   Site Manager displays the Timeslots window (Figure 8-9).

Figure 8-9. Timeslots Window

4. **Select additional B channels or deselect existing B channels.**

   Site Manager does not let you remove B channels if the number of channels will be less than the number of timeslots used by the line pool.

5. **Click on OK.**

   You return to the PRI Logical Lines window.

6. **Click on Apply to save the changes.**

7. **Click on Done.**

Modifying the ISDN Pool Channel Count and Priority

The pool channel count and priority are part of the ISDN logical line configuration because they define the logical B channels, not the physical line. Before changing the logical line configuration, you must delete all circuits associated with that pool. Refer to the appropriate circuit customizing chapter for instructions.

To modify the pool channel count and priority:

1. **Begin at the Configuration Manager window.**

2. **Select Dialup > Demand, Backup, or Bandwidth On Demand Pools.**

   Site Manager displays the Pools window (refer to Figure 8-1).

3. **Select the pool containing the ISDN lines you want to modify.**

4. **Click on Edit.**

   Site Manager displays the Lines Definition window (refer to Figure 1-4).

5. **Click on an ISDN, MCT1, or MCE1 connector.**

   Site Manager displays the ISDN Logical Lines window (Figure 8-10).

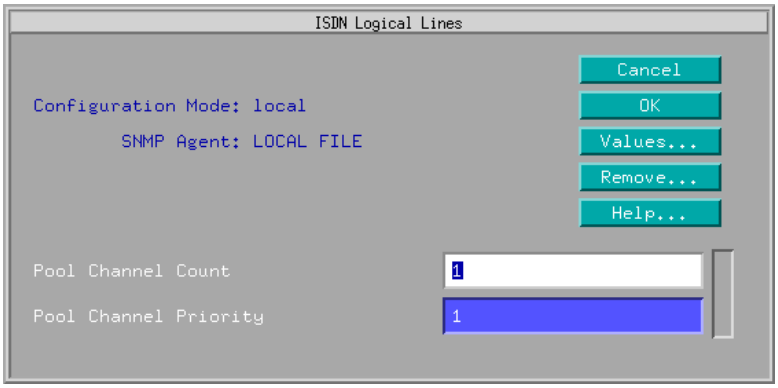


Figure 8-10. ISDN Logical Lines Window

6. **Modify the pool channel count to change the number of B channels in the pool.**

Site Manager: Pool Channel Count parameter: page A-20

7. **Enter a new pool channel priority for each line in the pool.**

Site Manager: Pool Channel Priority parameter: page A-21

8. **Click on OK.**

   You return to the Lines Definition window.

9. **Select File > Exit.**

10. **Click on Done.**

Modifying the ISDN Switch Type

If you change the switch type, the router disconnects any existing calls as the ISDN software makes changes to account for the new switch. Once the changes are made, the software restarts and you can reconnect.

To modify the switch type:

1. **Begin at the Configuration Manager window.**
2. **Select Dialup > Edit Switch Parameters.**

   Site Manager displays the ISDN Configured Switches window (Figure 8-11).

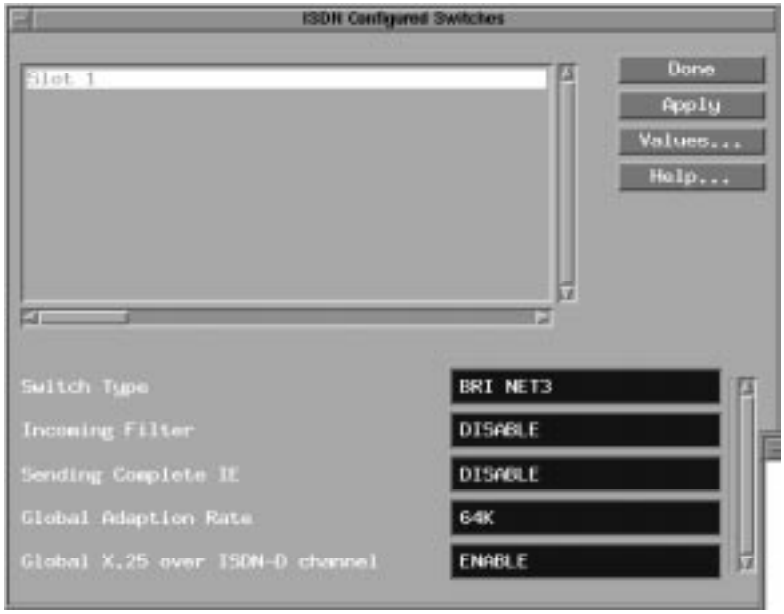


Figure 8-11. ISDN Configured Switches Window

The Global X.25 over ISDN-D Channel parameter does not appear for PRI.

3. **Enter a new switch type.**

Site Manager: Switch Type parameter: page A-16

4. **Click on Apply, then click on Done.**

Enabling Incoming Call Filtering

Incoming call filtering enables you to use caller ID service, which identifies the incoming caller. By enabling incoming call filtering, the router rejects any unauthorized caller. Refer to Chapter 4 for more information.

To enable incoming call filtering:

1. **Begin at the Configuration Manager window.**
2. **Select Dialup > Edit Switch Parameters.**

   Site Manager displays the ISDN Configured Switches window (refer to Figure 8-11).
3. **Select Enable for the Incoming Filter parameter.**

Site Manager: Incoming Filter parameter: page A-18

4. **Click on Apply, then click on Done.**

Modifying the Adaption Rate

To send and receive data transmitting at a rate of 56 Kb/s across a 64 Kb/s line, you must modify the adaption rate. Refer to Chapter 4 for more information on this feature.

To modify the adaption rate:

1. **Begin at the Configuration Manager window.**
2. **Select Dialup > Edit Switch Parameters.**

   Site Manager displays the ISDN Configured Switches window (refer to Figure 8-11).
3. **Select 56 Kb/s for the Global Adaption Rate parameter.**

Site Manager: Global Adaption Rate parameter: page A-19

4. **Click on Apply, then click on Done.**

The Global Adaption Rate parameter works with the Adaption Rate parameter in the outgoing phone list. Refer to Chapter 12 to learn how to customize phone lists.

Informing the Switch That Call Setup Is Complete

Some switches require that the router include an information element in the call setup. An *information element* is a number that informs the switch that call setup is complete, which makes call setup more efficient.

To enable this feature:

1. **Begin at the Configuration Manager window.**
2. **Select Dialup > Edit Switch Parameters.**

   Site Manager displays the ISDN Configured Switches window (refer to Figure 8-11).
3. **Select Enable for the Sending Complete IE parameter.**

Site Manager: Sending Complete IE parameter: page A-18

4. **Click on Apply, then click on Done.**

Configuring X.25 over a D Channel (BRI only)

To reduce the cost of connecting to an X.25 network, you can send X.25 packets over an ISDN D channel instead of sending them over leased lines. To use the D channel for X.25 packet transmission, the baud rate must be a maximum of 9600 bps so data is not lost. Refer to Chapter 4 for more information. You should have already configured BRI service according to the instructions in Chapter 1.

This feature is only for NET3 switch types in Germany and France.

Caution: If you enable or disable this feature dynamically, the router disconnects all existing calls across the B channels as the ISDN software makes changes for the feature. Once the changes are complete, the software restarts and you can make calls again.

To configure X.25 over the D channel for a BRI line:

1. **Begin at the Configuration Manager window.**
2. **Click on an ISDN connector.**

   Site Manager displays the ISDN Dialup window (refer to Figure 8-6).

3. **Click on Edit D Chan.**

   Site Manager displays the BRI Interface Configuration window (refer to Figure 8-7).

4. **Enter Enable for the X.25 over ISDN-D Channel parameter.**

Site Manager: X.25 over ISDN-D Channel parameter: page A-24

5. **Modify the defaults for the TEI Type and TEI Value parameters, if necessary.**

Site Manager: TEI Type for X.25 over ISDN-D parameter: page A-25
Site Manager: TEI Value for X.25 over ISDN-D parameter: page A-25

6. **Click on OK.**

   If this is the first BRI line that you are configuring, Site Manager displays the ISDN Switch Configuration window (similar to the window shown in Figure 8-11). Accept the defaults and click on OK.

   Site Manager then displays the X.25 Packet and Service configuration windows. You must configure certain parameters in each of these windows. Refer to *Configuring X.25 Services* for instructions. Once you exit from the X.25 windows, you return to the ISDN Dialup window (refer to Figure 8-6).

7. **Click on Done.**

Disabling X.25 over the D Channel

When you configure X.25 over the D channel, Site Manager automatically enables the Global X.25 over ISDN-D Channel parameter in the ISDN Configured Switches window (refer to Figure 8-11). This parameter disables the feature on a per-slot basis. For routers with only one slot, disabling this parameter removes the feature from the router altogether.

To disable X.25 over the D channel:

1. **Begin at the Configuration Manager window.**
2. **Select Dialup > Edit Switch Parameters.**

   Site Manager displays the ISDN Configured Switches window (refer to Figure 8-11).

3. **Select Disable for the Global X.25 over ISDN-D Channel parameter.**

Site Manager: Global X.25 over ISDN-D Channel parameter: page A-19

4. **Click on Apply, then click on Done.**

Modifying the BRI Line That Uses X.25 Service over the D Channel

You can modify the BRI line after you enable X.25 service over the D channel.

To modify the line:

1. **Begin at the Configuration Manager window.**
2. **Click on the ISDN connector.**

   Site Manager displays the Edit Connector window (Figure 8-12).

Figure 8-12. Edit Connector Window

3. **Click on Edit Line.**

   Site Manager displays the BRI Interface Configuration window (refer to Figure 8-7).

4. **Modify the parameters according to the descriptions in Appendix A.**
5. **Click on OK.**

Modifying the X.25 Circuit for Service over the D Channel

You can modify the X.25 Service and Packet parameters after you enable X.25 service over the D Channel.

To modify the X.25 circuit:

1. **Begin at the Configuration Manager window.**
2. **Click on the ISDN connector.**

   Site Manager displays the Edit Connector window (refer to Figure 8-12).
3. **Click on Edit Circuit.**

   Site Manager displays the Circuit Definition window (Figure 8-13).

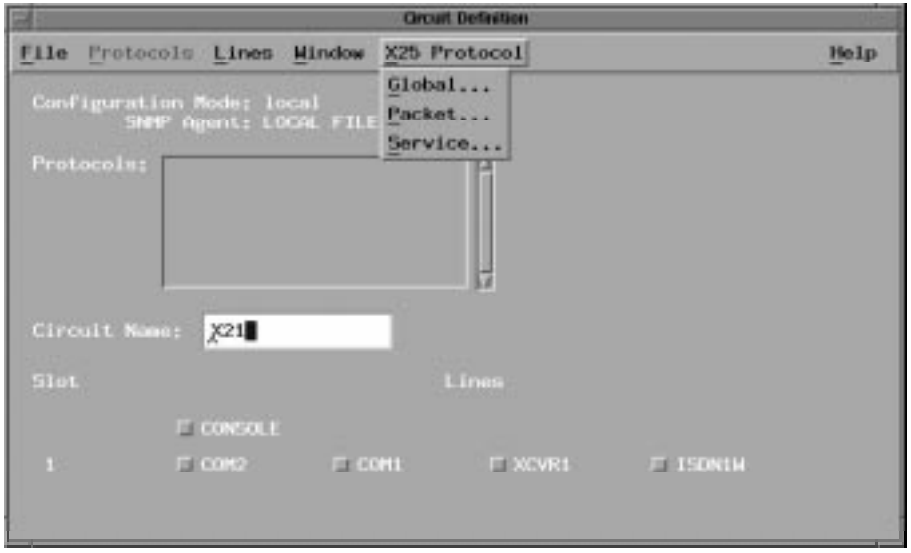


Figure 8-13. Circuit Definition Window

4. **Select X25 Protocol > Packet to modify the packet configuration.**
5. **Select X25 Protocol > Service to modify the service configuration.**

   Refer to *Configuring X.25 Services* for parameter descriptions.
6. **Click on OK.**

Configuring a BRI Leased Line (Germany and Japan only)

If your ISDN service provider does not use the D channel for call setup, or if you can use ISDN leased lines at an economical rate, you may configure your ISDN line to act as a leased line. Remember that BRI is only supported on the ASN, AN, ANH, and ARN.

To set up a BRI leased line:

1. **Begin at the Configuration Manager window.**
2. **Click on an ISDN connector.**

   Site Manager displays the Port Application window (refer to Figure 1-8).
3. **Select a leased option for the port application mode, then click on OK.**

Site Manager: Port Application Mode parameter: page A-15

Site Manager displays the ISDN Leased Line B Channels window (Figure 8-14), which shows the two leased B channels.

Figure 8-14. ISDN Leased Line B Channels Window

4. **Click on Done.**

   Site Manager displays the Add Circuit window (Figure 8-15).

Figure 8-15. Add Circuit Window

5. **Click on an ISDN connector.**

   Site Manager supplies a value for the Circuit Name parameter. Accept this name or specify another.

6. **Click on OK.**

   Site Manager displays the WAN Protocols menu (Figure 8-16).

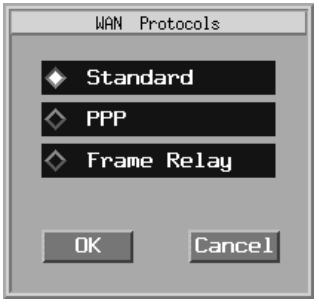


Figure 8-16. WAN Protocols Menu

7. **Select a WAN protocol, then click on OK.**

   Site Manager prompts you to select a LAN protocol.

8. **Select a LAN protocol, then click on OK to complete the configuration.**

Modifying BRI Leased-Line Configurations

Although call setup is not performed on the D channel, the ISDN switch uses the D channel to send and receive bits that activate and deactivate the ISDN interface. Therefore, you may want to edit the D channel for your leased-line configuration. If noise or other minor problems on the ISDN network are causing the router to deactivate the line frequently, you can modify the BRI T4 Timer parameter to prevent this from happening.

Modify the BRI T4 timer as follows:

1. **Begin at the Configuration Manager window.**
2. **Click on an ISDN connector that is configured as a leased line.**

   Site Manager displays the ISDN Leased Line B Channels window (refer to Figure 8-14).
3. **Click on Edit D Chan.**

   Site Manager displays the BRI Interface Configuration window (Figure 8-17).

Figure 8-17. BRI Interface Configuration Window for the BRI T4 Timer

4. **Enter a new value for the BRI T4 Timer parameter.**

Site Manager: BRI T4 Timer parameter: page A-23

Removing B Channels from a Pool

To remove B channels from a line pool:

1. **Begin at the Configuration Manager window.**
2. **Select Dialup > Demand, Backup, or Bandwidth On Demand Pools.**

   Site Manager displays the Pools window (refer to Figure 8-1).
3. **Select the pool containing the ISDN lines you want to modify.**
4. **Click on Edit.**

   Site Manager displays the Lines Definition window (refer to Figure 1-4).
5. **Click on an ISDN, MCT1, or MCE1 connector.**

   Site Manager displays the ISDN Logical Lines window (refer to Figure 8-10).
6. **Click on Remove to remove the B channels from the pool.**

   If you remove all of the lines in the pool, Site Manager removes the pool as well.
7. **Click on OK.**

   You return to the Lines Definition window.
8. **Select File > Exit.**
9. **Click on Done.**

Removing BRI and PRI from the Router

Before you delete the BRI and PRI physical interface, you must delete the dial-up circuits and pools.

Removing BRI

To remove BRI from the pool:

1. **Begin at the Configuration Manager window.**
2. **Click on the ISDN connector.**

   Site Manager displays the ISDN Dialup window (Figure 8-18).

Figure 8-18. ISDN Dialup Window

3. **Click on Delete All.**

   Site Manager removes BRI service.

4. **Click on Done.**

Removing PRI

To remove PRI from the pool:

1. **Begin at the Configuration Manager window.**
2. **Click on an MCT1 or MCE1 connector.**

   Site Manager displays the PRI Logical Lines window (refer to Figure 8-8).
3. **Click on Delete PRI.**

   Site Manager removes PRI service.
4. **Click on Done.**

Chapter 9
Customizing Demand Circuits

This chapter explains how to

- Configure Frame Relay demand circuits
- Customize PPP and Frame Relay demand circuits
- Configure demand circuit groups

You should have set up a demand pool in Chapter 1 and added PPP demand circuits. For information about PPP and Frame Relay, refer to *Configuring PPP Services* and *Configuring Frame Relay Services*, respectively.

Configuring Frame Relay Demand Circuits

To configure Frame Relay demand circuits:

1. **Begin at the Configuration Manager window.**
2. **Select Dialup > Demand Circuits.**

   Site Manager displays the Demand Pools window (Figure 9-1).

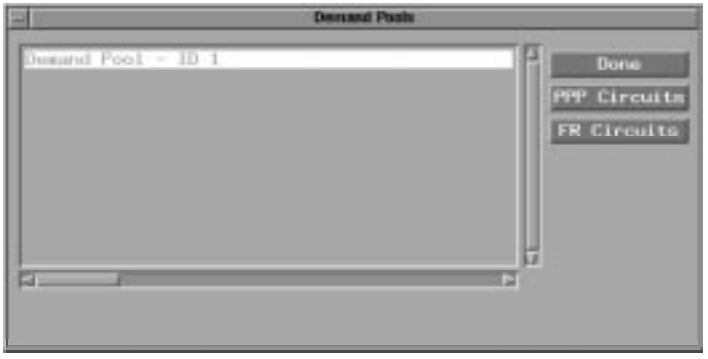


Figure 9-1. Demand Pools Window

3. **Select a demand pool and click on FR Circuits.**

   Site Manager displays the FR Demand Circuits window (Figure 9-2).

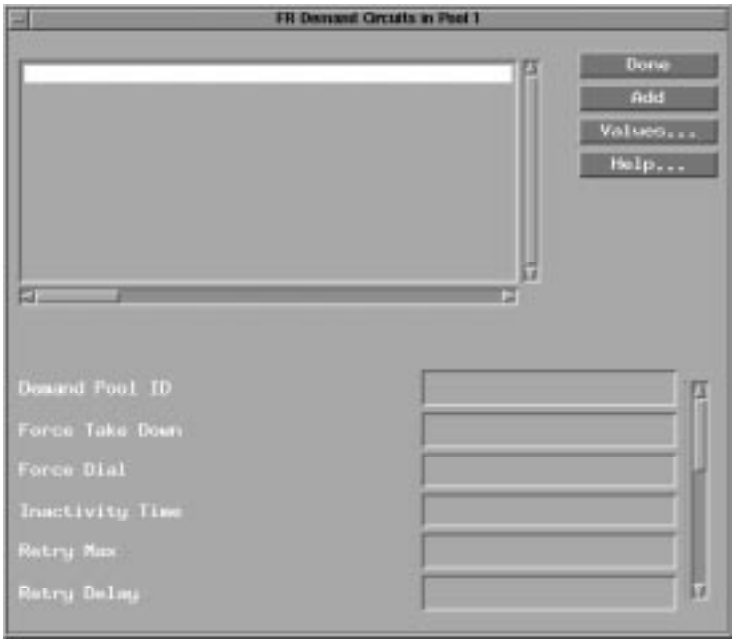


Figure 9-2. FR Demand Circuits Window

4. **Click on Add to add a demand circuit.**

   Site Manager displays the new circuit along with its defaults (Figure 9-3). The circuit uses the demand pool that you previously selected.

Figure 9-3. Completed FR Demand Circuits Window

5. **Repeat step 4 for each demand circuit you want to add.**
6. **To modify the circuit defaults, refer to "Customizing PPP and Frame Relay Demand Circuits" on page 9-10.**
7. **Click on Done to return to the Demand Pools window.**

Modifying the Frame Relay Interface

Once you configure a Frame Relay demand circuit, Site Manager configures the Frame Relay interface, which you can modify. The interface parameters define the Frame Relay characteristics of the circuit, not the demand circuit.

To modify the Frame Relay interface:

1. **Begin at the Configuration Manager window.**
2. **Select Dialup > Demand Circuits.**

   Site Manager displays the Demand Pools window (refer to Figure 9-1).
3. **Click on FR Circuits.**

   Site Manager displays the FR Demand Circuits window (refer to Figure 9-3).
4. **Click on Demand Intf.**

   Site Manager displays the FR Demand Interface List window (Figure 9-4).

Figure 9-4. FR Demand Interface List Window

5. **Modify the parameters according to the descriptions in Appendix A.**

Modifying Frame Relay Service Records

A Frame Relay service record is a data structure that allows flexible grouping and characterization of PVCs. Each record can contain one or more PVCs. The router creates the first service record automatically when you select Frame Relay as the WAN protocol. This is the *default service record*. If a PVC is not included in a configured service record, it uses the default service record.

To modify the default service record or add service records:

1. **Begin at the Configuration Manager window.**
2. **Select Dialup > Demand Circuits.**

   Site Manager displays the Demand Pools window (refer to Figure 9-1).
3. **Click on FR Circuits.**

   Site Manager displays the FR Demand Circuits window (refer to Figure 9-2).
4. **Click on Demand Intf.**

   Site Manager displays the FR Demand Interface List window (refer to Figure 9-4).
5. **Click on Services.**

   Site Manager displays the Frame Relay Demand Service List window (Figure 9-5).

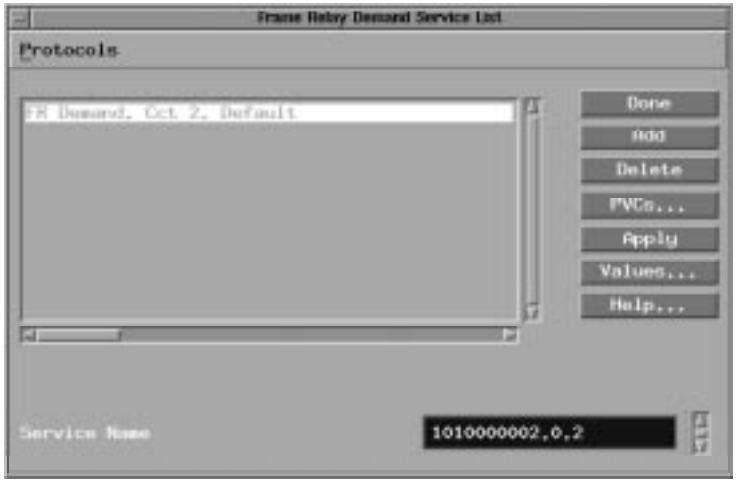


Figure 9-5. Frame Relay Demand Service List Window

6. **Site Manager supplies the service name. Modify it only if you are sure the new name is unique for the router.**

Site Manager: Service Name parameter: page A-71

7. **Click on Add to create a service record, or go to step 8.**
8. **Click on PVCs to configure PVCs for the service record, or go to step 9.**

   Site Manager displays the FR PVC List for Demand Services window (Figure 9-6).

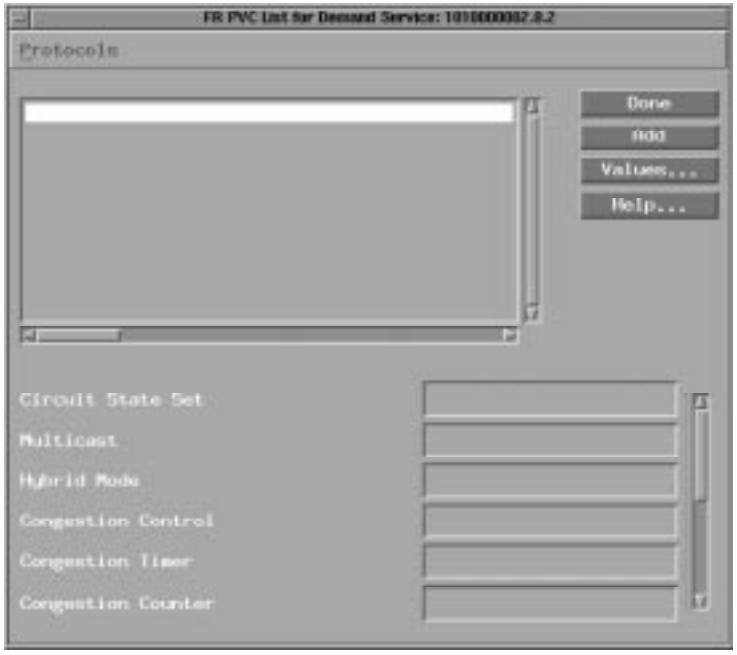


Figure 9-6. FR PVC List for Demand Services Window

9. **Click on Add to add a PVC to the service record.**

   Site Manager displays the Frame Relay PVC Add window (Figure 9-7).

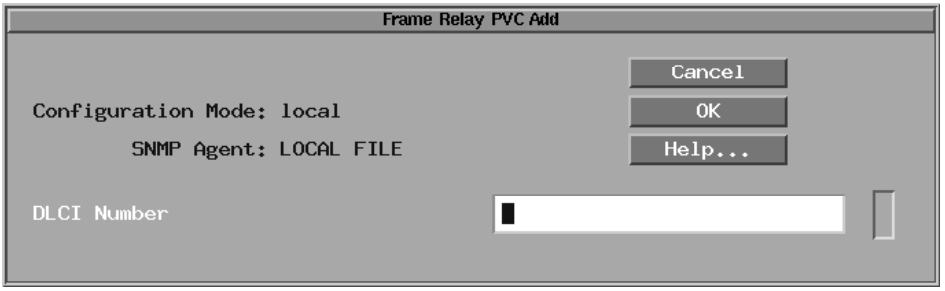


Figure 9-7. Frame Relay PVC Add Window

10. **Enter a value for the DLCI Number parameter, then click on OK.**

    You return to the Frame Relay PVC List for Demand Services window (refer to Figure 9-6).

11. **Accept the defaults or modify the PVC parameters according to the descriptions in Appendix A.**

    For more information about Frame Relay service records and PVCs, refer to *Configuring Frame Relay Services*.

12. **Click on Done.**

Adding Protocols to Frame Relay Demand Circuits

To add protocols to a Frame Relay demand circuit:

1. **Begin at the Configuration Manager window.**
2. **Select Dialup > Demand Circuits.**

   Site Manager displays the Demand Pools window (refer to Figure 9-1).

3. **Click on FR Circuits.**

   Site Manager displays the FR Demand Circuits window (refer to Figure 9-3).

4. **Select a circuit, then click on Demand Intf.**

   Site Manager displays the FR Demand Interface List window (refer to Figure 9-4).

5. **Click on Services.**

Site Manager displays the Frame Relay Demand Service List window (refer to Figure 9-5).

6. **Select Protocols > Add/Delete in the top left corner of the window.**

   Site Manager displays the Select Protocols window (Figure 9-8).

Figure 9-8. Select Protocols Window

7. **Select one or more protocols for this demand circuit, then click on OK.**

   For each protocol you select, Site Manager displays windows that prompt you for required information. Consult the appropriate protocol manual.

8. **Click on Done**.

Customizing PPP and Frame Relay Demand Circuits

After you configure a PPP or Frame Relay demand circuit, Site Manager adds several buttons (Apply, Schedule, Phone Out, and Delete) to each demand circuit window. You use these buttons to edit the parameter defaults.

To edit the demand circuit parameters:

1. **Begin at the Configuration Manager window.**
2. **Select Dialup > Demand Circuits.**

   Site Manager displays the Demand Pools window (refer to Figure 9-1).
3. **Click on PPP Circuits or FR Circuits.**

   Site Manager displays the appropriate demand circuit window (refer to Figure 9-3 as an example).
4. **Select a circuit you want to modify.**
5. **Enter new values for the parameters, according to Table 9-1 and the parameter descriptions in Appendix A.**
6. **Click on Apply to save the changes.**
7. **Click on Done.**

Table 9-1 lists ways to customize PPP and Frame Relay demand circuits and the parameters you use to make those changes.

Table 9-1. Customizing Demand Circuits

Task	Site Manager Parameter	Location in Appendix A
Force the circuit to activate or deactivate	Force Dial Force Take Down	page A-26 page A-26
Deactivate the circuit based on inactivity	Inactivity Time	page A-27
Retry the connection if it fails	Retry Max Retry Delay	page A-27 page A-28
Change which router initiates a call	Connection Mode	page A-28

(continued)

Table 9-1. Customizing Demand Circuits *(continued)*

Task	Site Manager Parameter	Location in Appendix A
Terminate a failed connection and use another circuit to reach the same destination	Auto Demand Termination Auto Demand Term. Reset	page A-29 page A-29
Modify PPP authentication information (PPP only)	CHAP Local Name CHAP Secret PAP Local ID PAP Password Outbound Authentication	page A-37 page A-38 page A-39 page A-40 page A-41
Specify the duration of the circuit	Maximum Up Time Max UpTime Termination UpTime Term. Reset Minimum Call Duration Inactivity Mode	page A-42 page A-42 page A-43 page A-43 page A-44
Change the demand circuit name	Circuit Name	page A-30
Enable dial optimized routing	Dial Optimized Routing	page A-30
Configure standby circuits (PPP only)	Standby Mode Standby Failback Mode Manual Standby Action Standby Primary Circuit	page A-32 page A-32 page A-33 page A-33
Enable the callback feature (PPP only)	Callback Mode Callback Server Delay Time (sec) Callback Client Delay Time (sec)	page A-34 page A-36 page A-36
Specify how long the router waits to send routing updates over Frame Relay demand circuits (for use with dial optimized routing)	Routing Update Hold Time	page A-31

Changing the Default Authentication Protocol (PPP only)

CHAP is the default authentication protocol. To select PAP, you must open the PPP Interface List window, select the line record for dial lines, and specify PAP for the Local Authentication Protocol parameter. For more information about PPP and configuring authentication protocols, see *Configuring PPP Services*.

Bandwidth-on-Demand Service for Demand Lines (PPP only)

If the demand line becomes congested, the router can provide an additional 29 dial-up lines to reduce the congestion. In Chapter 1, you had an opportunity to enable bandwidth-on-demand service for a demand circuit. Refer to that chapter for instructions. To modify the bandwidth-on-demand parameters, refer to Chapter 11.

Adding Protocols to PPP Demand Circuits

In Chapter 1, you added IP to a PPP demand circuit. To add other protocols:

1. **Begin at the Configuration Manager window.**
2. **Select Dialup > Demand Circuits.**

   Site Manager displays the Demand Pools window (refer to Figure 9-1).
3. **Click on PPP Circuits.**

   Site Manager displays the PPP Demand Circuits window (refer to Figure 1-17).
4. **Select Protocols > Add/Delete in the top left corner of the window.**

   Site Manager displays the Select Protocols window (refer to Figure 9-8).
5. **Select one or more protocols for the demand circuit.**

   For each protocol you select, Site Manager displays windows that prompt you for required information. Consult the appropriate protocol manual.
6. **Click on OK.**

   You return to the PPP Demand Circuits window.
7. **Click on Done.**

Note: You cannot configure protocol prioritization for demand circuits running PPP multilink. Protocol prioritization modifies the order in which packets are sent over the line, which could change the multilink-assigned order of packets and cause problems with the data.

Scheduling When the Demand Circuit Is Available

After you finalize the demand circuit's configuration, you schedule when the circuit is available. To do this:

1. **Begin at the Configuration Manager window.**
2. **Select Dialup > Demand Circuits.**

   Site Manager displays the Demand Pools window (refer to Figure 9-1).
3. **Click on PPP Circuits or FR Circuits.**

   Site Manager displays the appropriate demand circuit window (refer to Figure 9-3 as an example).
4. **Click on Schedule.**

   Site Manager displays the Circuit Time of Day Schedule window (PPP) or the Pool Availability window (Frame Relay). The windows are the same but the titles are different (Figure 9-9).

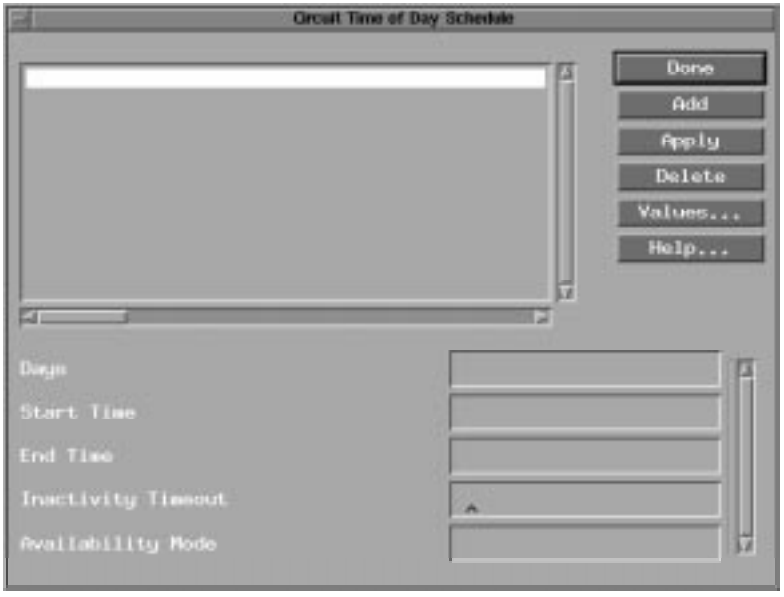


Figure 9-9. Circuit Time of Day Schedule Window

5. **Click on Add.**

Site Manager displays the Circuit Time of Day Schedule window (Figure 9-10). This window is the same for PPP and Frame Relay circuits.

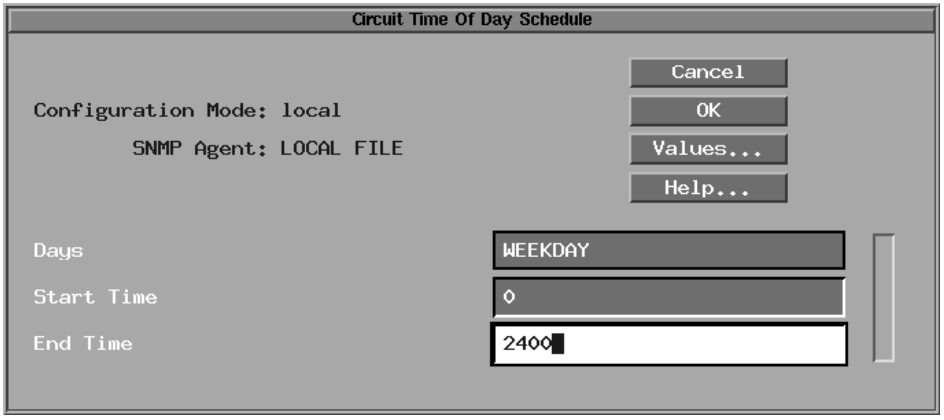


Figure 9-10. Circuit Time of Day Schedule Window

6. **Accept the parameter defaults or specify a new schedule, according to the parameter descriptions in Appendix A.**

7. **Click on OK.**

   You return to the completed Circuit Time of Day Schedule window (Figure 9-11) or the Pool Availability window, which shows a schedule entry.

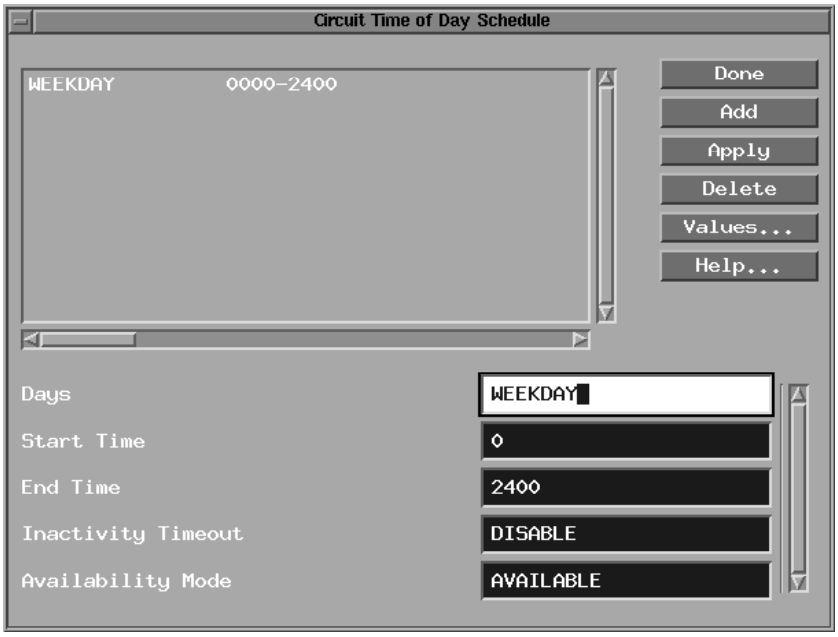


Figure 9-11. Completed Circuit Time of Day Schedule Window

8. **You can revise the schedule by changing the parameters values and clicking on Apply.**

   Refer to Appendix A for parameter descriptions.

9. **Click on Done.**

Configuring Demand Circuit Groups

To simplify configuration of unnumbered interfaces in a large network, you can configure a demand circuit group. Refer to Chapter 5 for more information about demand circuit groups.

To configure a demand circuit group:

1. **Begin at the Configuration Manager window.**
2. **Select Dialup > Demand Circuit Groups.**

   Site Manager displays the Demand Circuit Groups window (Figure 9-12).

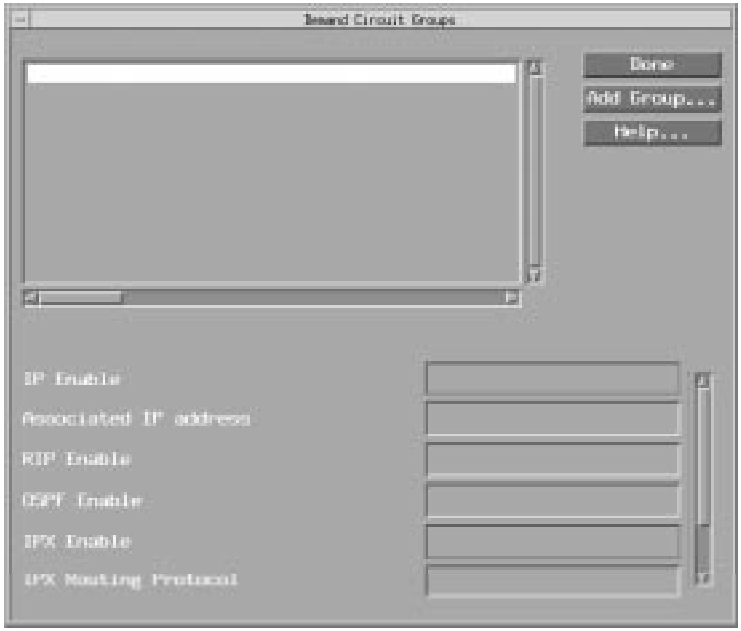


Figure 9-12. Demand Circuit Groups Window

3. **Click on Add Group.**

   Site Manager displays the Enter a Demand Pool window (Figure 9-13).

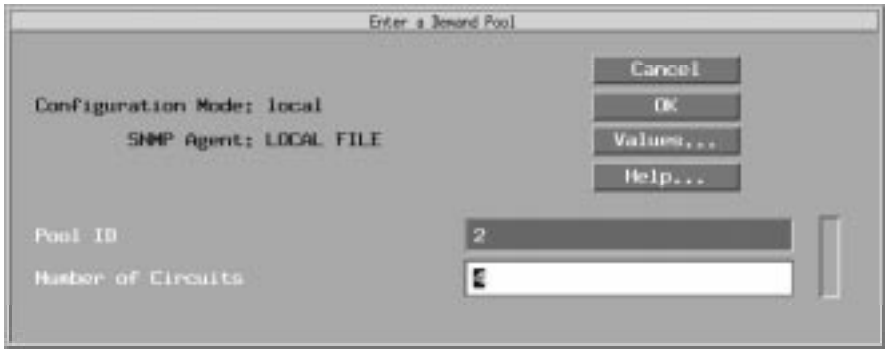


Figure 9-13. Enter a Demand Pool Window

4. **Enter the demand pool ID that this group should use.**

Site Manager: Pool ID parameter: page A-51

5. **Enter the number of circuits you want in the group.**

Site Manager: Number of Circuits parameter: page A-51

6. **Click on OK.**
7. **Go to the next section, "Caller Resolution Information for Demand Circuit Groups."**

Caller Resolution Information for Demand Circuit Groups

After you specify the demand pool ID and the number of circuits for a demand circuit group, Site Manager displays the Caller Resolution Info window (Figure 9-14). You use this window to enter the CHAP name or PAP ID of the remote routers associated with this demand circuit group. When a remote call comes in, the router activates a circuit from the specified circuit group.

Site Manager prompts you for this information because demand circuit groups cannot initiate calls. Site Manager ensures that you make an entry for the remote router in the caller resolution table so that the local router, configured with the demand circuit group, can accept incoming calls.

Figure 9-14. Caller Resolution Info Window

Complete the Caller Resolution Info window as follows:

1. **Enter values for the parameters, according to the descriptions in Appendix A.**

   You can make additional entries in the caller resolution table. Refer to Chapter 13 for instructions.

2. **Click on OK when you are finished.**

   You return to the Demand Circuit Groups window, which shows the new demand circuit group and its demand pool (Figure 9-15).

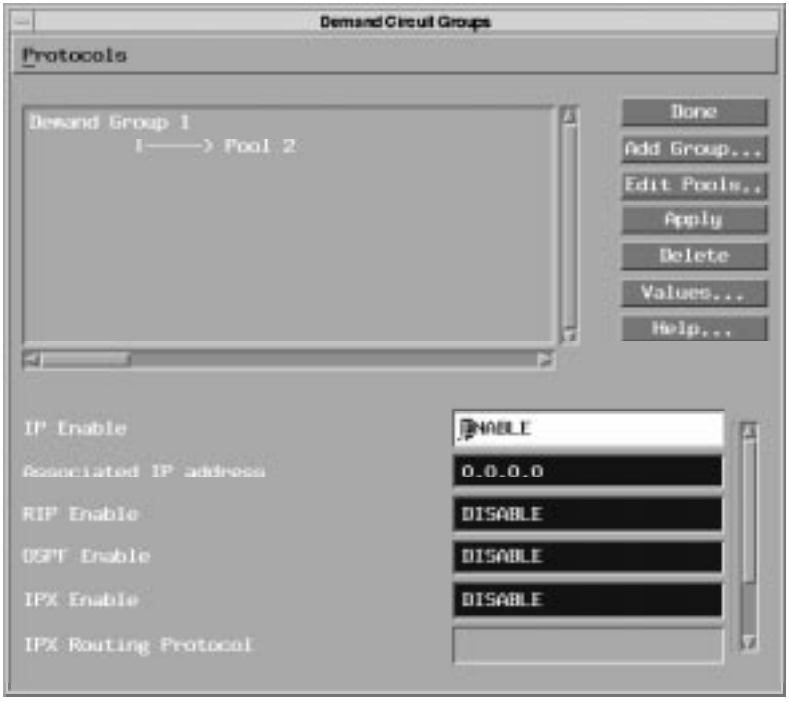


Figure 9-15. Completed Demand Circuit Groups Window

3. **Enable the unnumbered protocols that you want for this demand circuit group.**

   For parameter descriptions, refer to Appendix A.

4. **Click on Done.**

Modifying the Demand Circuit Group Configuration

To modify the demand circuit group configuration:

1. **Begin at the Configuration Manager window.**
2. **Select Dialup > Demand Circuit Groups.**

   Site Manager displays the Demand Circuit Groups window (refer to Figure 9-15).
3. **To add a demand circuit group, click on Add Group, then click on Apply.**
4. **To change the protocol that the circuit group uses, disable the current protocol and enable another one, then click on Apply.**

   For parameter descriptions for each protocol, refer to Appendix A.
5. **Click on Done.**

Modifying the Number of Circuits in a Demand Circuit Group

To modify the number of circuits in a demand circuit group:

1. **Begin at the Configuration Manager window.**
2. **Select Dialup > Demand Circuit Groups.**

   Site Manager displays the Demand Circuit Groups window (refer to Figure 9-15).
3. **Click on Edit Pools.**

   Site Manager displays the Demand Circuit Group window (Figure 9-16).

Figure 9-16. Demand Circuit Group Window

4. **Change the number of circuits in the group.**

Site Manager: Number of Circuits parameter: page A-51

5. **Click on Done.**

   You return to the Demand Circuit Groups window (refer to Figure 9-15).

6. **Click on Done.**

Modifying the Demand Pool That the Demand Circuit Group Uses

To modify the demand pool used by the demand circuit group:

1. **Begin at the Configuration Manager window.**
2. **Select Dialup > Demand Circuit Groups.**

   Site Manager displays the Demand Circuit Groups window (refer to Figure 9-15).

3. **Click on Edit Pools.**

   Site Manager displays the Demand Circuit Group window (refer to Figure 9-16).

4. **Click on Add.**

   Site Manager displays the Enter a Demand Pool window (refer to Figure 9-13).

5. **Enter a new value for the Pool ID parameter, then click on OK.**

Site Manager: Pool ID parameter: page A-51

6. **Modify the value of the Number of Circuits parameter, if necessary.**

Site Manager: Number of Circuits parameter: page A-51

7. **Click on Done.**

   You return to the Demand Circuit Groups window (refer to Figure 9-15).

8. **Click on Done.**

Removing a Demand Circuit Group

To remove a demand circuit group:

1. **Begin at the Configuration Manager window.**
2. **Select Dialup > Demand Circuit Groups.**

   Site Manager displays the Demand Circuit Groups window (refer to Figure 9-15).

3. **Click on Edit Pools.**

   Site Manager displays the Demand Circuit Group window (Figure 9-16).

4. **Select the demand circuit group you want to remove.**
5. **Click on Delete to remove a demand circuit group.**
6. **Click on Done.**

   You return to the Demand Circuit Groups window (refer to Figure 9-15).

7. **Click on Done.**

Removing Demand Circuits

To remove a demand circuit:

1. **Begin at the Configuration Manager window.**
2. **Select Dialup > Demand Circuits.**

   Site Manager displays the Demand Pools window (refer to Figure 9-1).
3. **Click on PPP Circuits or FR Circuits.**

   Site Manager displays the appropriate demand circuit window (refer to Figure 9-3 as an example).
4. **Select the circuit you want to remove.**
5. **Click on Delete.**

   Site Manager removes the demand circuit.
6. **Click on Done.**

Chapter 10
Customizing Backup Circuits

The router activates a backup circuit when a leased circuit fails. To configure backup service, you designate a leased circuit as a *primary circuit*. This designation tells the router to activate a backup circuit if the leased circuit fails. If you have not configured a leased circuit, the Dialup > Backup Circuits option is not available.

You should have set up a backup pool according to the instructions in Chapter 1, and, for PPP configurations only, added PPP backup circuits.

This chapter describes how to configure and customize backup circuits for Frame Relay, PPP, and Standard primary circuits. Refer to Chapter 2 for a complete description of Frame Relay and PPP backup service.

Table 10-1 lists the instructions you should use to configure backup circuits.

Table 10-1. Dial Backup Configurations

Primary Circuit Protocol	Backup Circuit Protocol	Instructions
Standard	PPP (async or sync)	"Creating Backup Circuits," Chapter 1
PPP	PPP (async or sync)	
Frame Relay backing up only one PVC (*circuit backup*)	PPP (async or sync)	"Creating a PPP Backup Circuit for One Frame Relay PVC," page 10-2
Frame Relay backing up the entire interface (*link backup*)	Frame Relay	"Creating Frame Relay Backup Circuits for Multiple PVCs," page 10-5

You cannot configure a bandwidth-on-demand circuit as a primary circuit.

Creating a PPP Backup Circuit for One Frame Relay PVC

If your Frame Relay circuit is configured with only one PVC in the service record, you must configure PPP for the backup circuit. This is called *circuit backup*.

To configure a PPP backup circuit for a Frame Relay PVC:

1. **Configure a Frame Relay leased interface with a service record containing one PVC.**

   You need to add a new service record to the Frame Relay interface. When you add a service record, it automatically has only one PVC, which requires a DLCI number. Refer to *Configuring Frame Relay Services* for instructions.

2. **From the Configuration Manager window, select Dialup > Backup Circuits > PPP.**

   Site Manager displays the Primary Circuit Definition window (Figure 10-1 is an example), which lists the Frame Relay PVC (for example, DLCI 100).

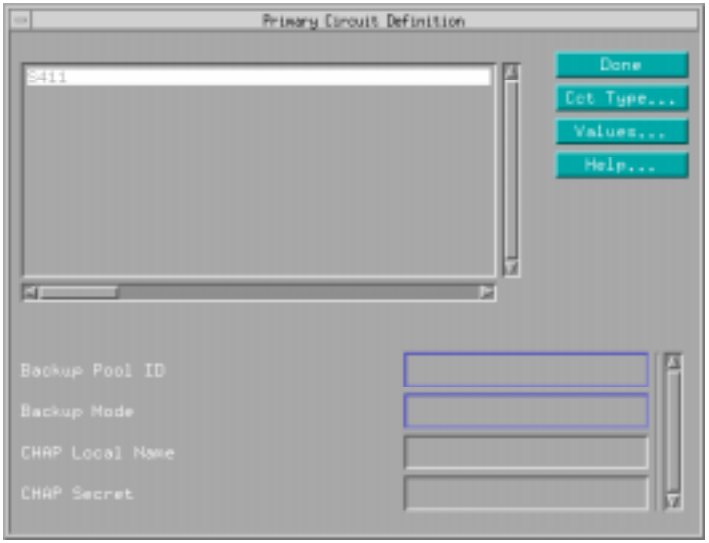


Figure 10-1. Primary Circuit Definition Window

3. **Select the Frame Relay circuit and click on Cct Type.**

   Site Manager displays the Circuit Options window (Figure 10-2).

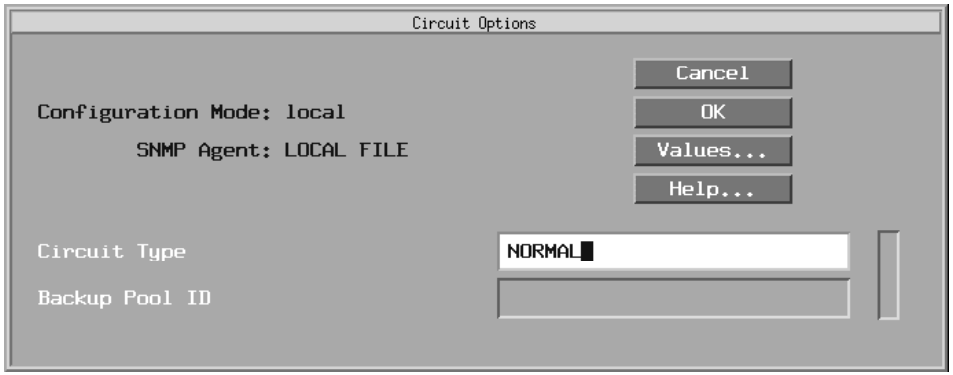


Figure 10-2. Circuit Options Window

4. **Select Primary for the Circuit Type parameter.**

Site Manager: Circuit Type parameter: page A-77

5. **Enter the ID of the backup pool that you want this circuit to use.**

Site Manager: Backup Pool ID parameter: page A-57

6. **Click on OK.**

   You return to the completed Primary Circuit Definition window (Figure 10-3).

Figure 10-3. Completed Primary Circuit Definition Window

7. **Repeat this procedure for each primary circuit you want to add.**

Creating Frame Relay Backup Circuits for Multiple PVCs

If your Frame Relay interface has multiple PVCs in the service record, you need to back up the entire interface. This is called *link backup*. For link backup, you must configure Frame Relay across the backup circuit. You cannot use link and circuit backup over the same Frame Relay interface.

To configure a Frame Relay backup circuit:

1. **Begin at the Configuration Manager window.**
2. **Select Dialup > Backup Circuits > Frame Relay.**

   Site Manager displays the FR Primary Interface Definition window (Figure 10-4).

Figure 10-4. FR Primary Interface Definition Window

3. **Click on Intf. Type.**

   Site Manager displays the FR Interface window (Figure 10-5).

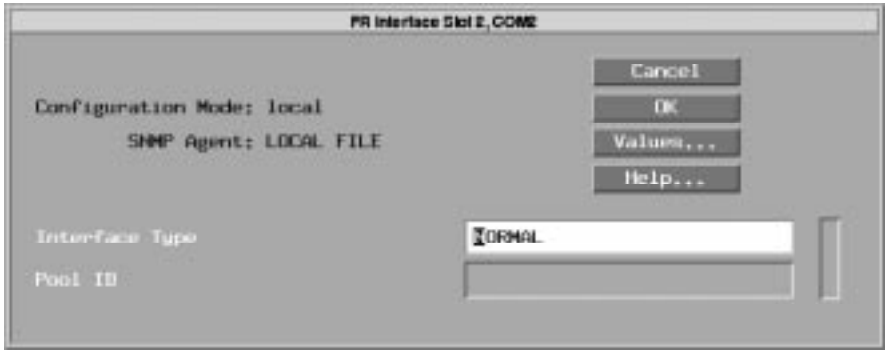


Figure 10-5. FR Interface Window

4. **Select Primary/Shared or Primary/Secondary for the Interface Type parameter.**

   The interface type determines whether the backup circuit shares the Frame Relay primary circuit's configuration or uses a unique configuration.

Site Manager: Interface Type parameter: page A-59

   If you select Primary/Secondary as the interface type, Site Manager informs you that you need to enable the Frame Relay interface. To do this, set the FR Service Control parameter to Enable. Refer to the following section, "Modifying the Frame Relay Backup Interface" to learn how to access this parameter.

5. **Enter the pool ID that you want this primary circuit to use.**

Site Manager: Pool ID parameter: page A-60

6. **Click on OK.**

   You return to the FR Primary Interface Definition window, which has four new buttons: Backup Def., Schedule, Phone Out, and Apply (Figure 10-6).

Figure 10-6. Completed FR Primary Interface Definition Window

Modifying the Frame Relay Backup Interface

After designating a primary circuit, Site Manager sets up the Frame Relay backup circuit with default values. The interface parameters define the Frame Relay characteristics of the circuit, unlike the primary interface parameters, which define the behavior of the backup circuit.

To modify the Frame Relay backup interface:

1. **Select Dialup > Backup Circuits > Frame Relay.**

   Site Manager displays the FR Primary Interface Definition window (refer to Figure 10-6).

2. **Click on Backup Def.**

   Site Manager displays the FR Backup Interface window (Figure 10-7).

Figure 10-7 shows the window for the Primary/Shared interface type. The window for the Primary/Secondary type is similar but does not include the Filters button. For secondary configurations, you configure filters using a different window.

Figure 10-7. FR Backup Interface Window for Primary/Shared Interfaces

3. **Accept the parameter defaults or modify them according to the descriptions in Appendix A.**
4. **Click on Done.**

Modifying Frame Relay Service Records

A Frame Relay service record is a data structure that allows flexible grouping and characterization of PVCs. Each record can contain one or more PVCs. The router creates the first service record automatically when you select Frame Relay as the WAN protocol. This is the *default service record*. If a PVC is not included in a configured service record, it uses the default service record.

To modify the default service record or add service records:

1. **Select Dialup > Backup Circuits > Frame Relay.**

   Site Manager displays the FR Primary Interface Definition window (refer to Figure 10-6).

2. **Click on Backup Def.**

   Site Manager displays the FR Backup Interface window (refer to Figure 10-7).

3. **Click on Services.**

   Site Manager displays the Frame Relay Backup Service List window (Figure 10-8).

Figure 10-8. Frame Relay Backup Service List Window

4. **Site Manager supplies the service name. Modify it only if you are sure the new name is unique for the router.**

Site Manager: Service Name parameter: page A-71

5. **Click on PVCs to configure PVCs for the service record; otherwise, go to step 9.**

   Site Manager displays the Frame Relay Backup PVC List window (Figure 10-9).

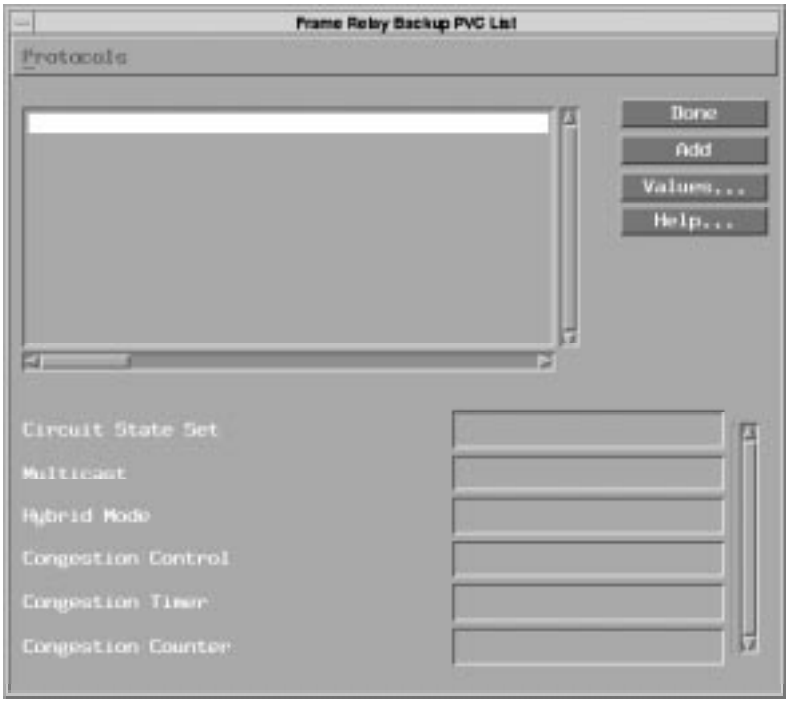


Figure 10-9. Frame Relay Backup PVC List Window

6. **Click on Add to add a PVC to the service record.**

   Site Manager displays the Frame Relay PVC Add window (Figure 10-10).

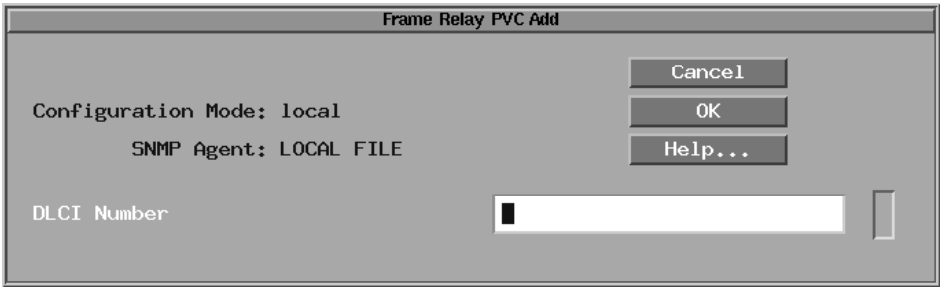


Figure 10-10. Frame Relay PVC Add Window

7. **Enter a value for the DLCI Number parameter, then click on OK.**

Site Manager: DLCI Number parameter: page A-72

You return to the Frame Relay Backup PVC List window.

8. **Accept the parameter defaults or modify them according to the descriptions in Appendix A.**

   For more information about Frame Relay service records and PVCs, refer to *Configuring Frame Relay Services*.

9. **Click on Done.**

Configuring Filters for Backup Configurations

To prevent unwanted traffic across a Frame Relay interface, you can define protocol priorities to ensure the arrival of critical data, and set up outbound filters to handle unwanted data.

Configuring Filters for Primary/Secondary Interfaces

To configure filters for primary/secondary interfaces:

1. **Begin at the Configuration Manager window.**
2. **Select Protocols > Edit Protocol Priority.**

   Site Manager displays the Priority/Outbound Filters window (Figure 10-11).

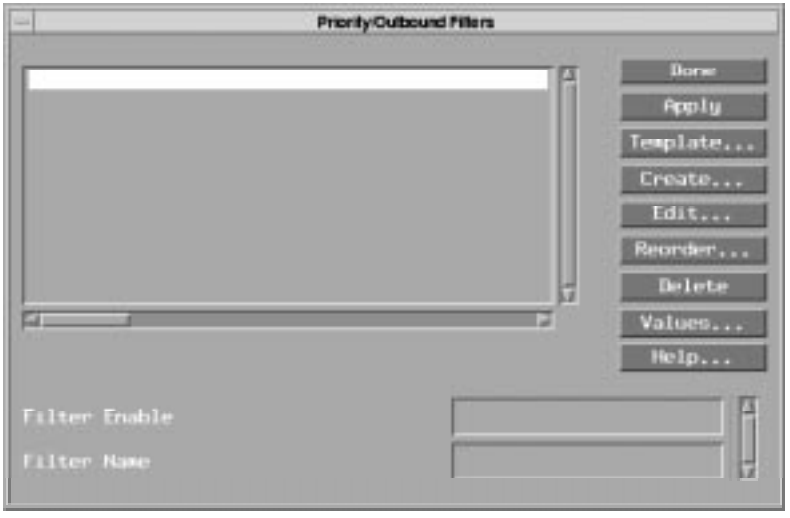


Figure 10-11. Priority/Outbound Filters Window

3. **Create, enable, and modify traffic filters.**

   Refer to *Configuring Traffic Filters and Protocol Prioritization* for detailed instructions.

4. **Click on Done.**

Configuring Filters for Primary/Shared Interfaces

To configure filters for primary/shared interfaces:

1. **Begin at the Configuration Manager window.**
2. **Select Dialup > Backup Circuits > Frame Relay.**

   Site Manager displays the FR Primary Interface Definition window (refer to Figure 10-6).
3. **Click on Backup Def.**

   Site Manager displays the FR Backup Interface window (refer to Figure 10-7).
4. **Click on Filters.**

   Site Manager displays the Priority/Outbound Filters window (refer to Figure 10-11).
5. **Create, enable, and modify traffic filters.**

   Refer to *Configuring Traffic Filters and Protocol Prioritization* for detailed instructions.

   If you do not configure filters for a primary/shared interface, the interface uses the primary circuit's filters.
6. **Click on Done.**

Customizing PPP and Frame Relay Backup Circuits

After you configure a primary circuit, Site Manager adds several buttons to the Primary Circuit Definition window and the FR Primary Interface Definition window (Apply, Schedule, Phone Out). Use them to modify the backup circuit.

To edit the backup circuit:

1. **Select the desired primary circuit and enter new values for the parameters, according to the descriptions in Appendix A.**
2. **Click on Apply to save your changes.**
3. **Click on Done to return to the Configuration Manager window.**

Table 10-2 lists ways to customize PPP and Frame Relay circuits.

Table 10-2. Customizing Backup Circuits

Task	Site Manager Parameter	Location in Appendix A
Change which router initiates a call (PPP only)	Backup Mode	page A-58
Modify PPP authentication information (PPP only)	CHAP Local Name CHAP Secret PAP Local ID PAP Password Outbound Authentication	page A-37, page A-38 page A-39 page A-40 page A-41
Customize the duration of the circuit	Maximum Up Time Max UpTime Termination UpTime Term. Reset	page A-42 page A-42 page A-43
Specify how long the router waits before activating a backup circuit (Frame Relay only)	Primary Down Time	page A-61
Enable the use of filters for backup (Frame Relay only)	Use Backup Interface Filters	page A-61

Changing the Authentication Protocol for the Primary Circuit

CHAP is the default authentication protocol. To select PAP, you must specify PAP for the Local Authentication Protocol parameter. For instructions to set this parameter, refer to *Configuring PPP Services*.

Scheduling When the Backup Circuit Is Available

After you complete the backup circuit configuration, you can schedule when the backup circuit is available for the primary circuit.

To specify a schedule for the backup circuit:

1. **Select Dialup > Backup Circuits > PPP or Frame Relay.**
2. **Click on Schedule in the Primary Circuit Definition window (refer to Figure 10-3) or the FR Primary Interface Definition window (refer to Figure 10-6).**

   Site Manager displays the first Circuit Time of Day Schedule window (Figure 10-12).

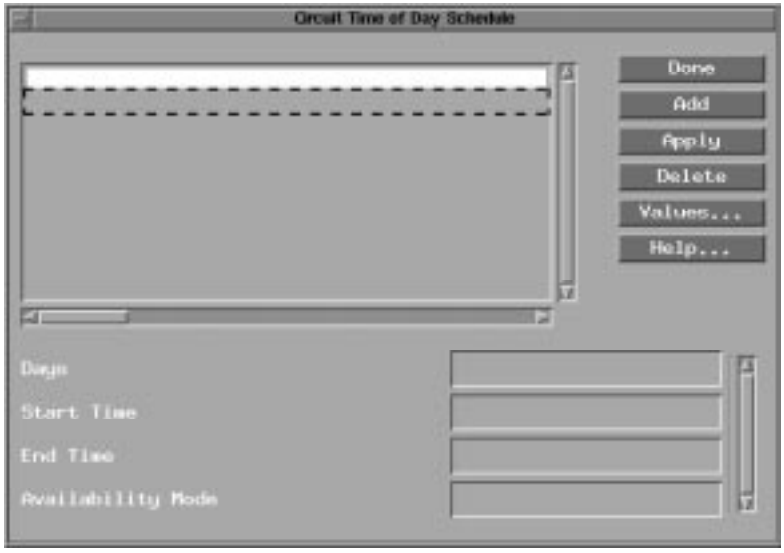


Figure 10-12. Circuit Time of Day Schedule Window

3. **Click on Add.**

   Site Manager displays the second Circuit Time of Day Schedule window (Figure 10-13).

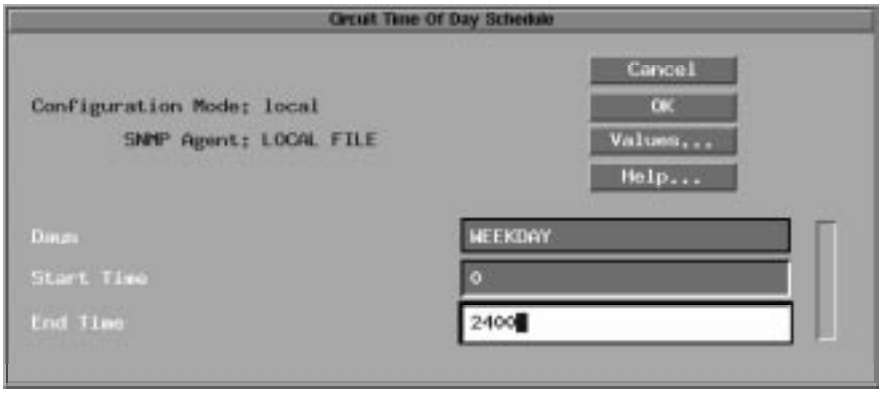


Figure 10-13. Circuit Time of Day Schedule Window

4. **Accept the parameter defaults or specify a new schedule, according to the parameter descriptions in Appendix A, then click on OK.**

   You return to the completed Circuit Time of Day Schedule window (Figure 10-14).

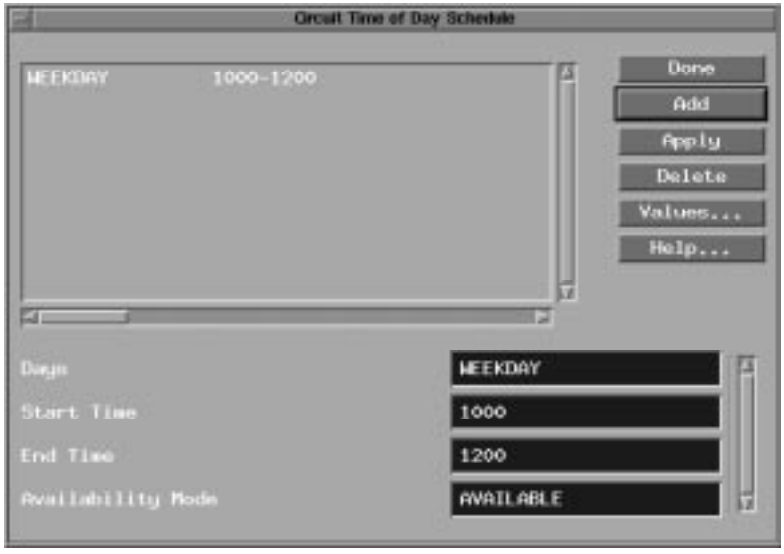


Figure 10-14. Completed Circuit Time of Day Schedule Window

5. **You can revise the schedule by changing the parameters values and clicking on Apply.**

   Refer to Appendix A for parameter descriptions.

6. **Click on Done.**

Removing PPP or Frame Relay Backup Service

To remove backup service:

1. **Select Dialup > Backup Circuits > PPP or Frame Relay.**

   Site Manager displays the Primary Circuit Definition window (refer to Figure 10-3) or the FR Primary Interface Definition window (refer to Figure 10-4).

2. **Click on either Cct Type or Intf. Type.**

   Site Manager displays the Circuit Options window (refer to Figure 10-2) or the FR Interface window (refer to Figure 10-5).

3. **Modify one of the following parameters:**

   - For PPP, change the Circuit Type parameter to Normal.

Site Manager: Circuit Type parameter: page A-57

   - For Frame Relay, change the Interface Type parameter to Normal.

Site Manager: Interface Type parameter: page A-59

   Site Manager asks you to confirm the change, then removes the backup circuit, and treats the leased circuit as a regular circuit.

4. **Click on OK.**

5. **Click on Done.**

Chapter 11
Customizing Bandwidth-on-Demand Circuits

This chapter describes how to modify the bandwidth-on demand configuration for your network.

To enable bandwidth-on-demand service, you can do the following:

- Designate a single leased circuit or leased multilink circuit as a bandwidth-on-demand circuit
- Associate a dial-on-demand circuit with a bandwidth-on-demand pool

If any of these circuits becomes congested, the router provides up to 29 additional dial-up circuits to relieve congestion, for a total of 30 circuits. You should have already set up a bandwidth-on-demand pool and circuit in Chapter 1.

Table 11-1 lists the terminology that Site Manager and this manual use to refer to circuits in a bandwidth-on-demand configuration.

Table 11-1. Terminology for Bandwidth-on-Demand Service

Type of Circuit	Referred to As
Leased circuit Leased multilink circuit	Bandwidth circuit You designate a leased circuit as a bandwidth circuit to enable bandwidth-on-demand service.
Dial-on-demand circuit	Demand circuit This is a demand circuit for which you can provide bandwidth-on-demand service. You do not designate this as a bandwidth circuit.
Dial-up circuit that helps the congested leased circuit	Dial-up or secondary circuit

Customizing Bandwidth-on-Demand Service

Once bandwidth-on-demand service is set up, Site Manager adds three new buttons to the Bandwidth-On-Demand Circuit Definition window (Apply, Phone Out, and Options). You can use these buttons to modify the parameter defaults.

To modify the configuration:

1. **Begin at the Configuration Manager window.**
2. **Select Dialup > Bandwidth On Demand Circuits.**

   Site Manager displays the Bandwidth-On-Demand Circuit Definition window (Figure 11-1).

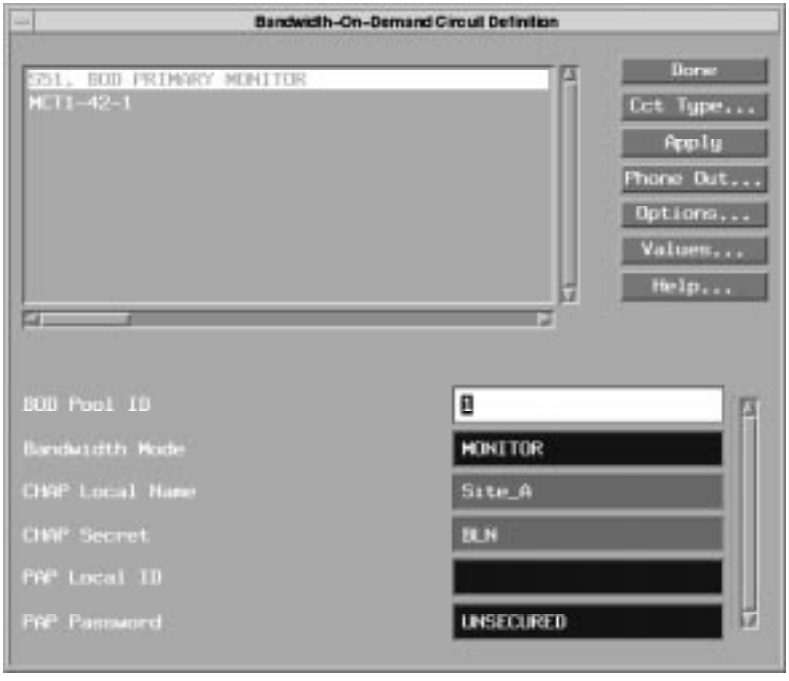


Figure 11-1. Bandwidth-On-Demand Circuit Definition Window

   This window lists the bandwidth circuit that you configured in Chapter 1.

3. **Select an existing circuit or add a new circuit, then enter new values for the parameters according to the descriptions in Appendix A.**

4. **Click on Apply to save your changes.**
5. **Click on Done to return to the Configuration Manager window.**

Table 11-2 lists ways to modify your bandwidth-on-demand configuration.

Table 11-2. Customizing Bandwidth-on-Demand Service

Task	Site Manager Parameter	Location in Appendix A
Add bandwidth circuits	Circuit Type Bandwidth-On-Demand Pool ID	page A-77 page A-77
Determine which router monitors congestion	Bandwidth Mode	page A-78
Modify the authentication information	CHAP Local Name CHAP Secret PAP Local ID PAP Password Outbound Authentication	page A-37 page A-38 page A-39 page A-40 page A-41

Changing the Authentication Protocol

CHAP is the default authentication protocol. To select PAP, you must specify PAP for the Local Authentication Protocol parameter. Refer to *Configuring PPP Services* for instructions.

Monitoring Congestion on the Bandwidth or Demand Circuit

To relieve congestion across the leased bandwidth or demand circuit, a router on one side of the connection must monitor the traffic level on the circuit.

The Bandwidth Mode parameter in the Circuit Options window (refer to Figure 11-8) specifies which router monitors congestion. The default for this parameter is Non-Monitor. Changing the value to Monitor makes your router the congestion monitor. You can then modify the congestion monitor parameters, which determine when the router activates additional lines to relieve congestion.

Although Site Manager provides default values for the monitor parameters, edit them for your network applications. If the network is critical to your operations and you want to ensure expedient data transmission, customize your threshold values so that even with moderate congestion, the router activates additional lines. Remember to account for data compression, which will also relieve congestion over a line. Also, the cost of additional lines may determine how often you want the router to activate the lines.

To configure the monitor parameters:

1. **Select Dialup > Bandwidth On Demand Circuits.**

   Site Manager displays the Bandwidth-On-Demand Circuit Definition window (refer to Figure 11-1).

2. **Click on Options.**

   Site Manager displays the Bandwidth On Demand Monitor Options window (Figure 11-2).

Figure 11-2. Bandwidth On Demand Monitor Options Window

3. **Enter the bandwidth pool ID of the pool that the circuit should use.**

Site Manager: BOD Pool ID parameter: page A-79

4. **Verify that the PPP Circuit Mode parameter is set to Multilink Monitor.**

   If you selected Monitor for the bandwidth mode when you configured a bandwidth circuit in Chapter 1, Site Manager sets the PPP Circuit Mode parameter accordingly.

Site Manager: PPP Circuit Mode parameter: page A-80

5. **Accept the defaults or modify the parameters according to the descriptions in Appendix A.**

Table 11-3 explains how to change the monitor parameters.

Table 11-3. Changing the Monitor Parameters

Task	Site Manager Parameter	Location in Appendix A
Specify how often the router checks for congestion	BOD Exam Period	page A-81
Specify a percentage of the maximum amount of data that can be transmitted across the line	BOD Full Threshold	page A-81
Indicate the number of consecutive times the line exceeds the BOD Full Threshold and is considered congested	BOD Periods to Fail	page A-82
Instruct the router which slots to use to activate additional lines (for BAP and non-BAP bandwidth-on-demand service)	Preferred Bandwidth Slot Reserved Bandwidth Slot	page A-82 page A-83
Specify the maximum number of links in a multilink bundle	Maximum Links	page A-83
Specify a percentage that the data traffic must be reduced before the line is no longer considered congested	BOD Recovery Threshold	page A-84
Specify the number of consecutive times the line falls below the BOD Recovery Threshold and is not considered congested	BOD Periods to Recover	page A-84

6. **Click on OK to save your changes.**

Setting the Preferred and Reserved Slots

Table 11-3 explains how to change the monitor parameters from the Bandwidth On Demand Monitor Options window. You can also edit these parameters from the Bandwidth-On-Demand Pools window, as follows:

1. **Begin at the Configuration Manager window.**
2. **Select Dialup > Bandwidth On Demand Pools.**

   Site Manager displays the Bandwidth-On-Demand Pools window (Figure 11-3).

Figure 11-3. Bandwidth-On-Demand Pools Window

3. **Click on Priority.**

   Site Manager displays the Preferred/Reserved Slots for BOD Pool window (Figure 11-4).

Figure 11-4. Preferred/Reserved Slots for BOD Pool Window

4. **Enter a new value for each slot parameter.**

   Be sure to read the parameter descriptions because it is important to set these parameters correctly.

Site Manager: Preferred Bandwidth Slot parameter: page A-82
Site Manager: Reserved Bandwidth Slot parameter: page A-83

The slot parameters that you specify affect all circuits in the pool. Also, Site Manager applies these values to the same parameter in the Bandwidth On Demand Monitor Options window (refer to Figure 11-2).

If you change the lines in a bandwidth pool, and the Bandwidth Mode parameter for these lines is set to Monitor, Site Manager prompts you to enter new values for the Preferred and Reserved Bandwidth Slot parameters.

Setting the Preferred and Reserved Slots For BAP

If you configure BAP for dial-up circuits, the Bandwidth Mode parameter must be set to Dynamic Monitor. This enables the router to act as the monitor or non-monitor router. You must then configure the Preferred and Reserved Bandwidth Slot parameters so that the non-monitor router knows which slots to check first for available lines. The non-monitor router then sends the monitor router the phone number that it dials to activate the additional line.

Modifying Multilink Fragmentation

Multilink fragmentation lets the router break up data packets into smaller segments for efficient data transfer across multilink circuits. Fragmentation is enabled by default.

To modify the size of fragmentation packets or disable fragmentation:

1. **Begin at the Configuration Manager window.**
2. **Select Dialup > Bandwidth On Demand Circuits.**

   Site Manager displays the Bandwidth-On-Demand Circuit Definition window (refer to Figure 11-1).
3. **Click on Options.**

   Site Manager displays the Bandwidth On Demand Monitor Options window (refer to Figure 11-2).
4. **Scroll until you see the fragmentation parameters.**
5. **Modify the parameters as follows:**

   - To change the size of the fragmentation packets, select a new value for the Fragmentation Trigger Size parameter.

Site Manager: Fragmentation Trigger Size parameter: page A-85

   - To disable fragmentation, select Prohibited for the Multilink Fragmentation parameter.

Site Manager: Multilink Fragmentation parameter: page A-85

6. **Click on OK.**
7. **Click on Done.**

Enabling BAP for Bandwidth-on-Demand Service

BAP enables you to manage the allocation of bandwidth for links in a multilink bundle, that is, the dial-up circuits that relieve the congested bandwidth circuit.

Before enabling this protocol, you need to configure bandwidth-on-demand service according to the instructions in Chapter 1 and this chapter. For an overview of BAP, refer to Chapter 7.

To configure BAP:

1. **Begin at the Configuration Manager window.**
2. **Select Circuits > Edit Circuits.**

   Site Manager displays the Circuit List window (Figure 11-5).

Figure 11-5. Circuit List Window

3. **Select a leased circuit configured for bandwidth-on-demand service, then click on Edit.**

   The Circuit Definition window appears (Figure 11-6).

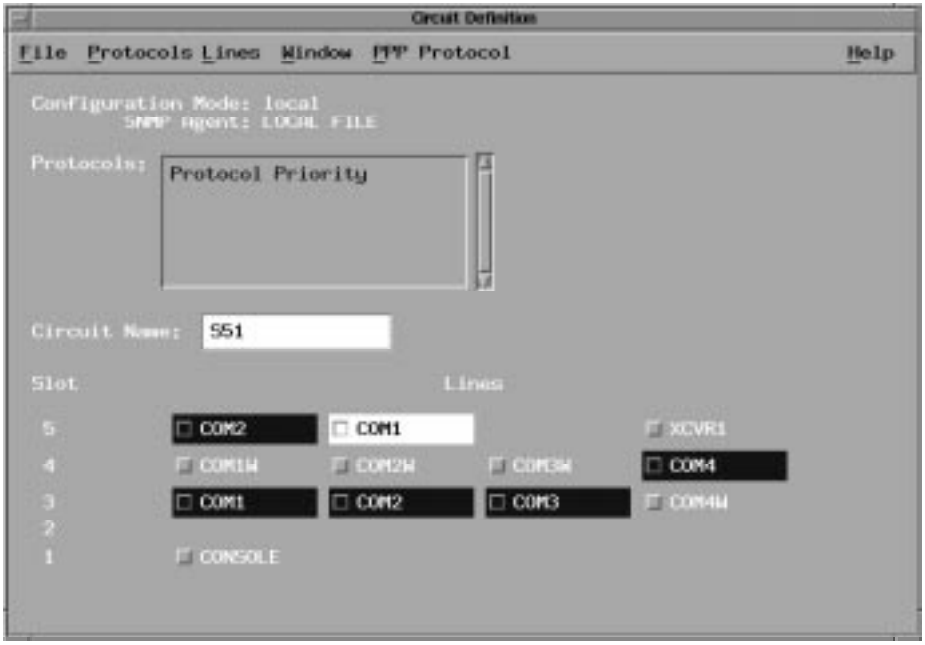


Figure 11-6. Circuit Definition Window

4. **Select Protocols > Add/Delete.**
5. **Select BAP and click on OK.**
6. **Select Protocols > Edit BAP > Interface.**

   Site Manager displays the Edit BAP Circuit Interface window (Figure 11-7).

Figure 11-7. Edit BAP Circuit Interface Window

7. **Accept the default, Enable, to enable BAP**.

Site Manager: Enable parameter: page A-86

8. **Select a value for the No Phone Number Needed parameter, using these guidelines:**

   - Accept the default, Disable, if the non-monitor router is supplying phone numbers to the monitor router during BAP negotiation.
   - Select Enable if all the required phone numbers are in the monitor router's outgoing phone list.

Site Manager: No Phone Number Needed parameter: page A-86

9. **Click on OK.**

   You return to the Circuit Definition window (refer to Figure 11-6).

10. **Select File > Exit.**

Removing Bandwidth-on-Demand Service

To remove bandwidth-on-demand service:

1. **Begin at the Configuration Manager window.**
2. **Select Dialup > Bandwidth On Demand Circuits.**

   Site Manager displays the Bandwidth-On-Demand Circuit Definition window (refer to Figure 11-1).
3. **Click on Cct Type.**

   Site Manager displays the Circuit Options window (Figure 11-8).

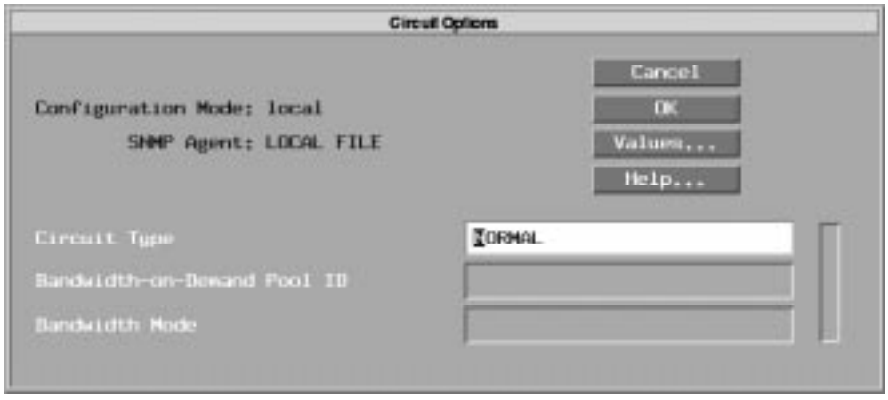


Figure 11-8. Circuit Options Window

4. **Set the Circuit Type parameter to Normal, then click on OK.**

   Site Manager asks you to confirm your change.
5. **Click on OK.**

   Site Manager removes the dial-up circuits and treats the leased circuit as a regular circuit.
6. **Click on OK.**

   You return to the Bandwidth-On-Demand Circuit Definition window.
7. **Click on Done.**

Chapter 12
Customizing Phone Lists

The router uses phone lists for calls to and from remote routers. If any of the lines in your pool are ISDN lines, or synchronous lines using V.25bis or Hayes signaling, you must set up phone lists. If a line uses Raise DTR signaling, the phone numbers are already stored in the modem, so phone lists are unnecessary.

Types of Phone Lists

There are three types of phone lists you can define for the router:

- The outgoing phone list
- The incoming phone list (for ISDN only)
- The local phone list (for ISDN only)

The *outgoing phone list* and *incoming phone list* contain the phone numbers of remote routers. The router places calls using numbers in the outgoing phone list and verifies incoming calls using numbers in the incoming phone list. Each remote router may have one or more phone numbers.

The *local phone list* contains the local router's phone numbers. It uses these numbers to identify itself when it places a call.

Note: Outgoing phone lists are associated with a specific circuit, not with the line, which the router uses for many different circuits. Consequently, the phone numbers are part of each circuit's configuration, not the line's configuration.

The following sections describe how the router uses phone lists for different types of calls.

How ISDN Calls Use Phone Lists

For ISDN calls, the router uses the local, outgoing, and incoming phone lists. The instructions to configure each phone list begin on page 12-3.

Outgoing and Incoming Phone Lists

The router uses the outgoing phone list to place calls to remote routers on an ISDN network. The router uses the incoming phone list to implement incoming call filtering. You use incoming call filtering with caller ID service, which lets you identify a remote caller. If you enable incoming call filtering, the router matches the caller's phone number with a number in the incoming phone list, which identifies and authorizes the caller. Features such as callback for demand circuits rely on incoming call filtering for certain callback modes. Refer to Chapter 5 for more information about the callback feature.

Caution: To use incoming call filtering, you must purchase caller ID service. If you enable incoming call filtering without having caller ID service, the router rejects all incoming calls.

Local Phone Lists

For BRI connections, the local phone list numbers identify the local calling router to remote routers on the network. The router places the local phone number in the ISDN outgoing call setup message. This number (along with SPIDs in the United States and Canada) also identifies the router to the ISDN switch. Certain switches require this number before they agree to activate a circuit. Your ISDN service provider assigns the numbers for your local phone list.

The router also uses the local phone list during BAP negotiations for bandwidth-on-demand service. The non-monitor router passes a local phone number to the monitor router when the monitor router requests additional bandwidth. When the monitor router receives the phone number, it uses that number to call back the non-monitor router, which then activates another line.

How V.25bis and Hayes Calls Use the Outgoing Phone List

For V.25bis and Hayes calls, the router uses the outgoing phone list to pass the remote router's phone number to the modem to establish a connection.

Creating an Outgoing Phone List

If you set up an ISDN configuration in Chapter 1, you have already set up an outgoing phone list. To modify this list, go to "Modifying the Outgoing Phone List" on page 12-7.

To create an outgoing phone list:

1. **Begin at the Configuration Manager window.**
2. **Select Dialup > Demand, Backup, or Bandwidth On Demand Circuits.**

   For backup and bandwidth circuits, Site Manager displays the appropriate Circuit Definition window. Figure 12-1 shows an example of the Primary Circuit Definition window for backup service.

   For demand circuits, Site Manager displays the Demand Pools window. Click on PPP Circuits or FR Circuits to open the appropriate Demand Circuits window.

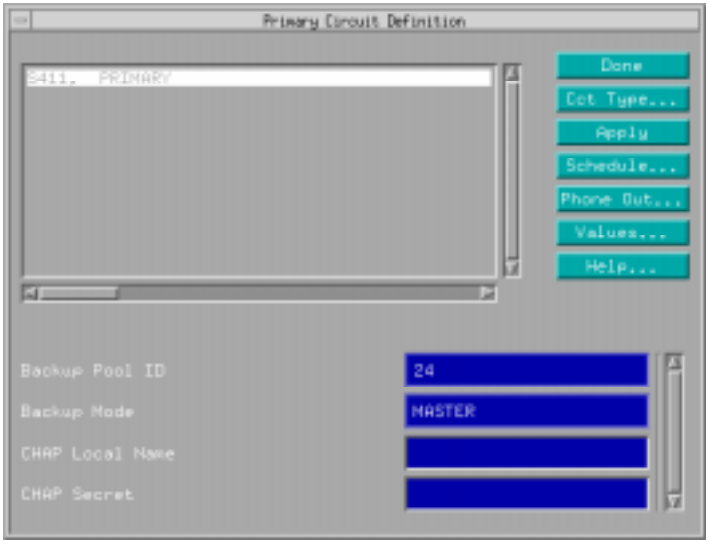


Figure 12-1. Primary Circuit Definition Window

3. **Select a circuit and click on Phone Out.**

   Site Manager displays the Outgoing Phone List window (Figure 12-2).

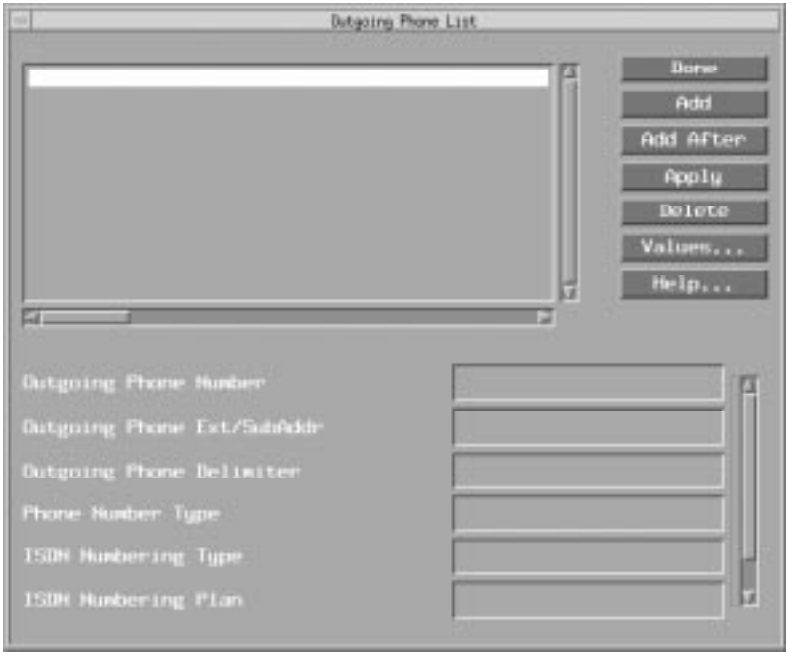


Figure 12-2. Outgoing Phone List Window

4. **Click on Add.**

   Site Manager displays the Phone Number window (Figure 12-3).

Note: The router dials the phone numbers in the order in which they occur in the list.

Figure 12-3. Phone Number Window

5. Enter a phone number.

Site Manager: Outgoing Phone Number parameter: page A-90

6. Enter an extension and delimiter, if applicable.

Site Manager: Outgoing Phone Ext/SubAddr parameter: page A-91
Site Manager: Outgoing Phone Delimiter parameter: page A-92

7. Specify the type of connection for this phone number.

Site Manager: Outgoing Phone Number Type parameter: page A-93

8. For Hayes dialing only, enter a phone prefix, that is, an AT command string.

Site Manager: Outgoing Phone Prefix parameter: page A-99

9. Click on OK when the phone entry is complete.

You return to the completed Outgoing Phone List window (Figure 12-4).

The first four fields and the last field are completed based on the entries in the Phone Number window (refer to Figure 12-3).

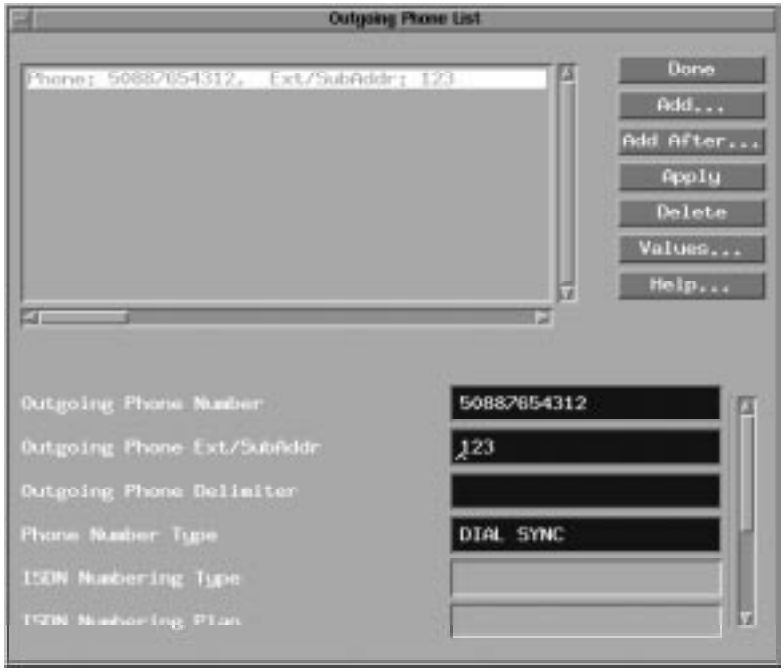


Figure 12-4. Completed Outgoing Phone List Window

10. **If the Phone Number Type parameter is set to ISDN, accept the defaults for the ISDN Numbering Type and ISDN Numbering Plan parameters, unless your service provider instructs otherwise.**

    For Dial Sync or Async phone numbers, ignore the ISDN parameters.

11. **Accept the defaults for the remaining parameters or modify them according to the descriptions in Appendix A.**

12. **Repeat the procedure for each phone number you want to add to the list.**

13. **Click on Done when you finish entering outgoing phone list numbers.**

    You return to the appropriate circuit window.

14. **Click on Done.**

Modifying the Outgoing Phone List

To modify the outgoing phone list:

1. **Begin at the Configuration Manager window.**
2. **Select Dialup > Demand, Backup, or Bandwidth On Demand Circuits.**

   For backup and bandwidth circuits, Site Manager displays the appropriate Circuit Definition window (refer to Figure 12-1 as an example).

   For demand circuits, Site Manager displays the Demand Pools window. Click on PPP Circuits or FR Circuits to open the appropriate Demand Circuits window.
3. **Select a circuit and click on Phone Out.**

   Site Manager displays the Outgoing Phone List window (refer to Figure 12-4).
4. **Modify the phone number according to the descriptions in Appendix A, using these guidelines:**

   - **Order of numbers** -- The order in which you enter the phone numbers is the order in which the router dials the numbers. To insert a number between two existing numbers, select the number that the new number should follow, then click on Add After.
   - **Changing numbers** -- If you want to change a phone number, click in the field for the parameter you want to modify. Enter a new value, then click on Apply. The phone number appears with the changes at the top of the window.
   - **Deleting numbers** -- If you want to delete a phone number, select the phone number and extension, if any, and click on Delete. Site Manager deletes the number.
5. **Click on Apply to ensure that the router accepts the changes.**
6. **Click on Done.**

   Table 12-1 lists all the changes you can make to the outgoing phone list.

Table 12-1. Customizing the Outgoing Phone List

Task	Site Manager Parameter	Location in Appendix A
Change the phone number	Outgoing Phone Number Outgoing Phone Ext/SubAddr Outgoing Phone Delimiter	page A-90 page A-91 page A-92
Modify the type of phone connection	Outgoing Phone Number	page A-90
Modify the ISDN numbering information	ISDN Numbering Type ISDN Numbering Plan	page A-94 page A-94
Modify the adaption rate of the call	Adaption Rate	page A-95
Change the type of line pool for the remote line (demand and bandwidth only)	Remote Pool Type	page A-96
Specify whether the phone number is for a single call or multiple calls	Connection Type	page A-97
Enable multirate service	Channel Bandwidth Type Aggregate Bandwidth	page A-98 page A-98
Change the AT command string (Hayes only)	Outgoing Phone Prefix	page A-99

Enabling PRI Multirate

PRI multirate lets you group B channels in multiples of 64 Kb/s to dynamically allocate bandwidth on a call-by-call basis.

To configure multirate, follow the instructions in the preceding section, "Modifying the Outgoing Phone List," and set the Channel Bandwidth Type parameter to Multirate. You can also specify the number of B channels the router can use for a call using the Aggregate Bandwidth parameter.

Creating an Incoming Phone List (ISDN only)

To create an incoming phone list for caller ID service:

1. **Begin at the Configuration Manager window.**
2. **Select Dialup > Incoming Phone Numbers.**

   Site Manager displays the Incoming Phone List window (Figure 12-5).

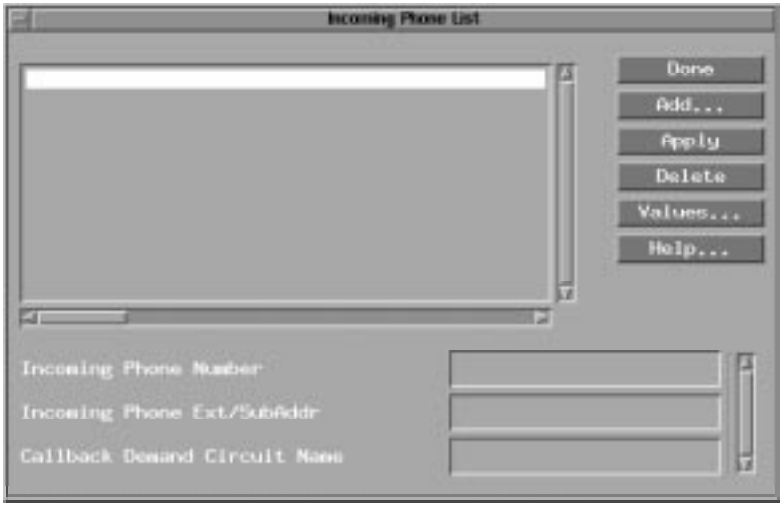


Figure 12-5. Incoming Phone List Window

3. **Click on Add to add a phone number.**

   Site Manager displays the Phone Number window (Figure 12-6).

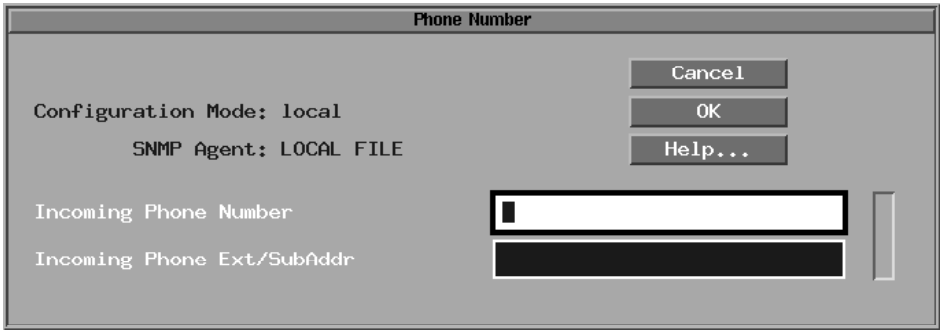


Figure 12-6. Phone Number Window

4. **Enter a phone number and extension, if applicable.**

Site Manager: Incoming Phone Number parameter: page A-100 Site Manager: Incoming Phone Ext/SubAddr parameter: page A-100

If this is a demand circuit for which you enabled the callback feature, the Phone Number window displays a third parameter, Callback Demand Circuit Name.

5. **If you enabled the callback feature, and the callback mode is Server One Charge or Server One Charge Call ID, enter a value for the Callback Demand Circuit Name parameter.**

Site Manager: Callback Demand Circuit Name parameter: page A-101

6. **Click on OK when the phone entry is complete.**
7. **Repeat this procedure for each phone number that you want to add to the list.**

   Be sure to enter the phone number of each remote node from which the router should accept calls.

   You return to the completed Incoming Phone List window (Figure 12-7).

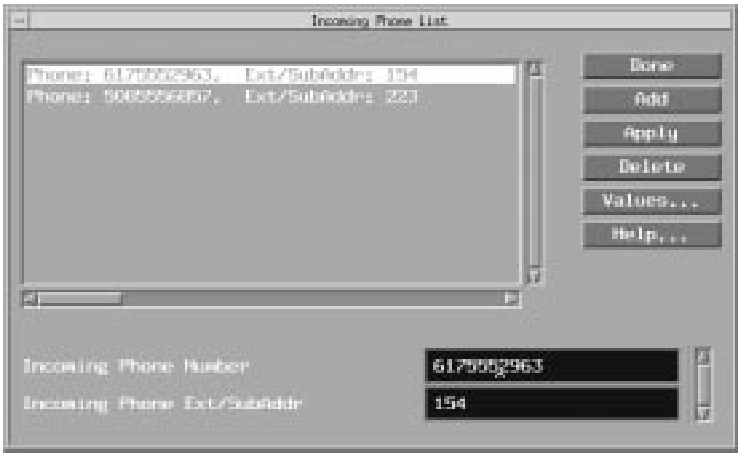


Figure 12-7. Completed Incoming Phone List Window for ISDN

8. **Click on Done when you finish entering phone numbers.**

Modifying the Incoming Phone List

To modify the incoming phone list:

1. **Begin at the Configuration Manager window.**
2. **Select Dialup > Incoming Phone List.**

   Site Manager displays the Incoming Phone List window (refer to Figure 12-7).

3. **Enter a new incoming phone number and extension, if applicable.**

Site Manager: Incoming Phone Number parameter: page A-100
Site Manager: Incoming Phone Ext/SubAddr parameter: page A-100

4. **Click on Apply to ensure that the router accepts the changes.**

   The new phone number appears in the list.

5. **To remove a phone number, select it in the list and click on Delete.**

   Site Manager removes the phone number.

6. **Click on Done.**

Creating a Local Phone List (ISDN only)

For bandwidth-on-demand connections that use BRI and PRI lines and BAP negotiation, you must configure the local phone list.

To create a local phone list:

1. **Begin at the Configuration Manager window.**
2. **Select Dialup > Local Phone Numbers.**

   Site Manager displays the ISDN Local Phone Lines window (Figure 12-8).

Figure 12-8. ISDN Local Phone Lines Window

3. **Click on Local Phones.**

   Site Manager displays the ISDN Local Phone Numbers window (Figure 12-9).

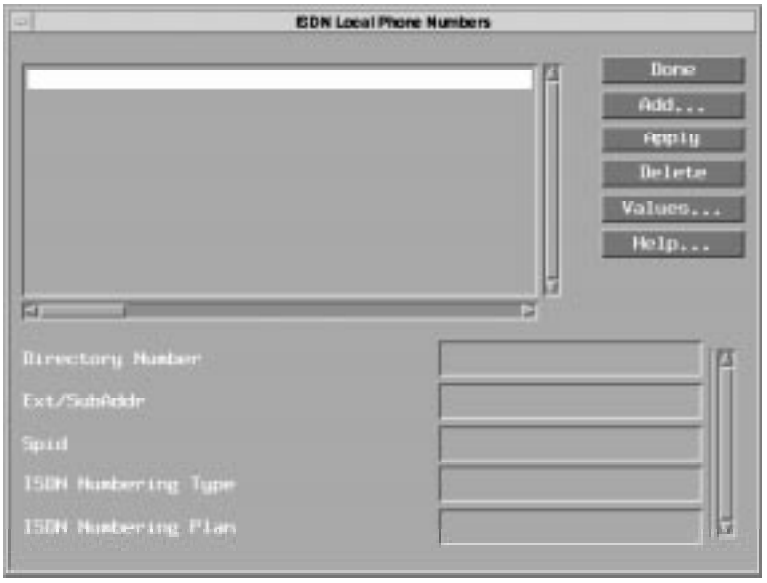


Figure 12-9. ISDN Local Phone Numbers Window

The SPID parameter appears only for switches in the United States and Canada.

4. **Click on Add.**

Site Manager displays the Phone Number window (Figure 12-10).

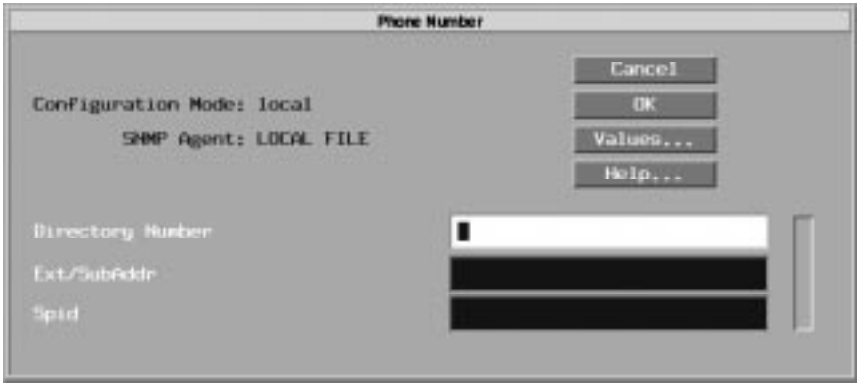


Figure 12-10. Phone Number Window

5. **Enter your local phone number and an extension, if any.**

Site Manager: Directory Number parameter: page A-87
Site Manager: Ext/SubAddr parameter: page A-87

6. **If you need to configure the SPID parameter, enter the ID assigned by the service provider; otherwise, go to step 7.**

Site Manager: SPID parameter: page A-88

7. **Click on OK.**

   You return to the completed ISDN Local Phone Numbers window.

8. **Click on Done.**

Chapter 13
Customizing Caller Resolution

For security purposes, all three dial services use a PPP identification mechanism to determine who is calling the router. PPP performs this identification process using one of two authentication protocols, CHAP or PAP.

CHAP is the default authentication protocol. To configure PAP, you must edit the PPP interface configuration and modify the Local Authentication Protocol parameter before setting up the caller resolution table. Refer to *Configuring PPP Services* for instructions.

To identify remote callers, you enter the caller name and CHAP secret or PAP password of each remote caller in the caller resolution table, and assign a local demand, primary, or bandwidth circuit to each caller.

The authentication process starts during link negotiation. The remote caller includes its CHAP name or PAP ID in the CHAP challenge or PAP authenticate request to the called router. When the called router receives the call, it checks its caller resolution table for a matching entry. If the remote caller is authorized, the called router activates the assigned circuit.

For more information about authentication, refer to Chapter 4.

Caller Resolution for Demand Circuit Groups

The router also uses the caller resolution table for demand circuit groups. Demand circuit groups can only receive calls. For a demand circuit group to accept an incoming call, you configure the table and assign the demand circuit group to a remote caller. After the router authorizes a remote caller, it activates a circuit from the assigned demand circuit group.

Adding Entries to the Caller Resolution Table

For PPP dial-up circuits using CHAP, you should have already set up the caller resolution table as described in Chapter 1. This chapter explains how to modify existing entries in the table and how to add new ones.

Before you set up your caller resolution table, you should have completed your dial-on-demand, dial backup, or bandwidth-on-demand configurations.

To configure the caller resolution table:

1. **Begin at the Configuration Manager window.**
2. **Select Dialup > Caller Resolution Table.**

   Site Manager displays the Caller Resolution Table window (Figure 13-1).

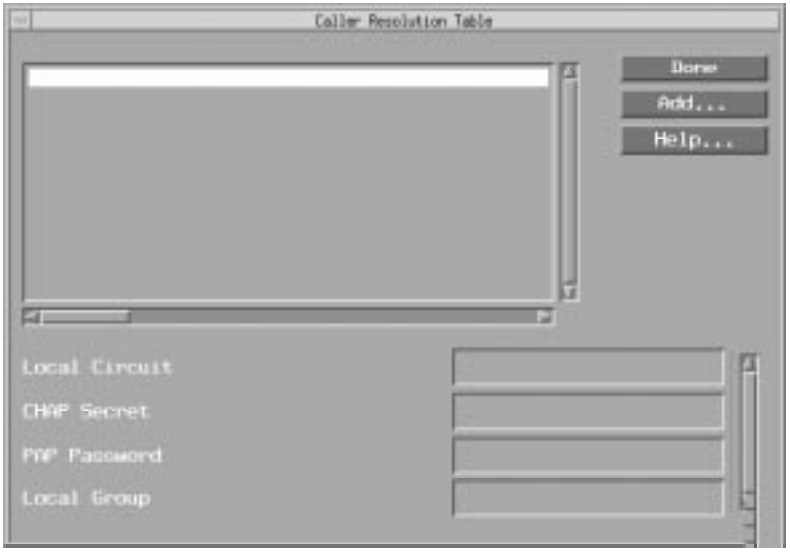


Figure 13-1. Caller Resolution Table Window

3. **Click on Add to add an entry to the table.**

   Site Manager displays the Caller Name and Secret/Password window (Figure 13-2).

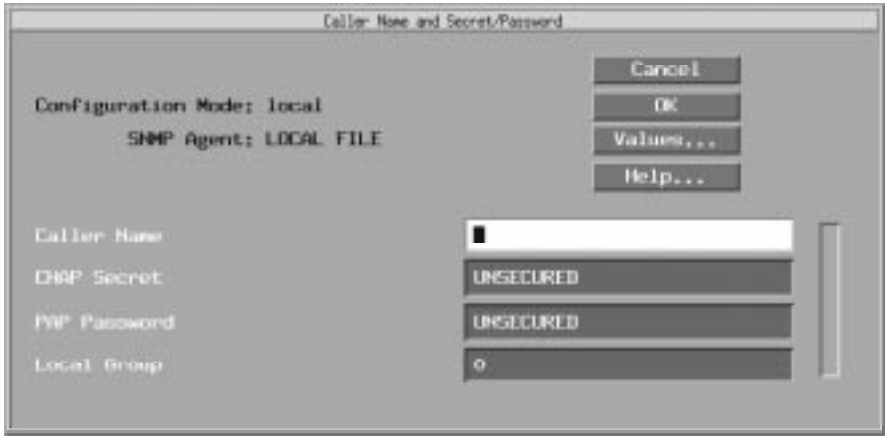


Figure 13-2. Caller Name and Secret/Password Window

4. **Enter a caller name, which is the remote caller's CHAP name or PAP ID.**

Site Manager: Caller Name parameter: page A-102

5. **Enter the remote caller's CHAP secret or PAP password.**

   The CHAP secret or PAP password that you enter must be the same one that you specified for the local router in the Circuit Definition window.

Site Manager: CHAP Secret parameter: page A-102
Site Manager: PAP Password parameter: page A-103

6. **If this entry is for a demand circuit group, specify the local group for the remote caller.**

Site Manager: Local Group parameter: page A-104

7. **Click on OK.**

   Site Manager displays the Local Circuit List window (Figure 13-3), which lists the previously configured demand, primary, or bandwidth circuits.

Figure 13-3. Local Circuit List Window

8. **Select a local circuit to assign it to the remote caller specified in the Caller Name parameter.**

   This is the circuit that the router activates when the remote caller places a call.

Site Manager: Local Circuit parameter: page A-103

9. **Click on OK.**

   Site Manager automatically assigns the local circuit to the remote caller.

   You return to the completed Caller Resolution Table window (Figure 13-4).

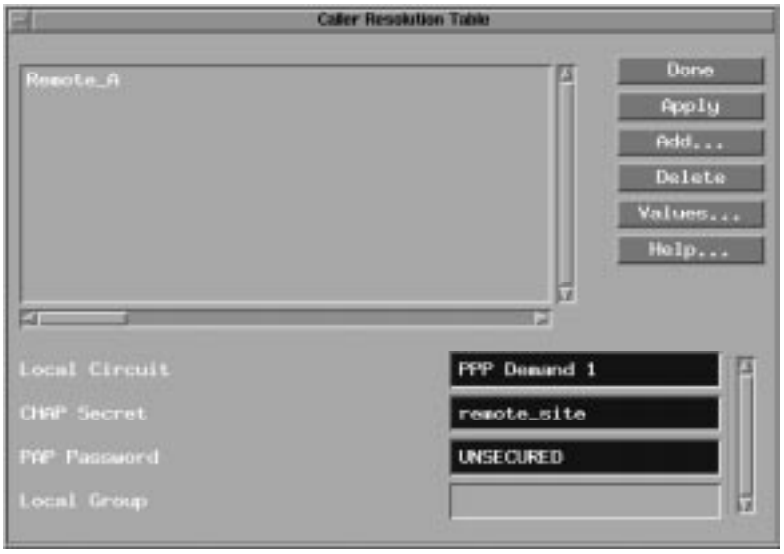


Figure 13-4. Completed Caller Resolution Table Window

Figure 13-4 shows a completed table entry. If the router receives an incoming call from Remote_A, it will activate the circuit PPP Demand 1.

10. **To delete an entry, select it and click on Delete.**
11. **Click on Done.**

    You return to the Configuration Manager window.

Modifying Entries in the Caller Resolution Table

To change entries in the caller resolution table:

1. **Begin at the Configuration Manager window.**
2. **Select Dialup > Caller Resolution Table.**

   Site Manager displays the Caller Resolution Table window (refer to Figure 13-1).
3. **Click in the field whose value you want to change, and enter a new value.**

   For the Local Circuit and Local Group parameters, you must click on Values and select a different circuit from the list, then click on OK.

   Refer to Appendix A for parameter descriptions.
4. **Click on Apply to accept the new entry.**
5. **Click on Done.**

Appendix A
Dial Service Parameters

Once a dial service is operating, you can modify any parameter for your network. This appendix describes each of the dial service parameters you can configure. The parameters are grouped by function and do not always follow the order in which they appear in the Site Manager windows. Table A-1 shows how the parameters are organized.

Table A-1. Organization of Parameters

Parameter Section	Location
Pool ID Parameter	page A-4
WAN Serial Interface Type Parameter	page A-4
Sync and Async Line Media Type Parameters	page A-5
External Modem Parameters	page A-7
V.34 Modem Parameters	page A-12
BRI Port Application Mode Parameter	page A-15
PRI Port Application Mode Parameter	page A-16
ISDN Switch Parameters	page A-16
Pool Channel Count and Priority Parameters	page A-20
BRI Configuration Parameters	page A-22
Demand Circuit Parameters (PPP and Frame Relay)	page A-26
Standby Circuit Parameters (PPP Demand Circuits only)	page A-32
Callback Parameters (PPP Demand Circuits only)	page A-34
Authentication Protocol Parameters (Demand, Backup, Bandwidth)	page A-37
Circuit Duration Parameters (Demand and Backup)	page A-42

(continued)

Table A-1. Organization of Parameters *(continued)*

Parameter Section	Location
Circuit Schedule Parameters (Demand and Dial Backup)	page A-45
Demand Circuit Group Parameters	page A-51
Demand Circuit Group Protocol Parameters	page A-54
Caller Resolution Info Parameters for Demand Circuit Groups	page A-52
PPP Circuit Options Parameters (Dial Backup)	page A-57
PPP Primary Circuit Definition Parameters (Dial Backup)	page A-58
Frame Relay Interface Type Parameter (Dial Backup)	page A-59
Frame Relay Primary Interface Definition Parameters (Dial Backup)	page A-61
Frame Relay Interface Parameters (Demand and Dial Backup)	page A-62
Service List Parameter (Demand and Dial Backup)	page A-71
Frame Relay PVC Parameters (Demand and Dial Backup)	page A-72
Bandwidth-on-Demand Circuit Options Parameters	page A-77
Bandwidth-on-Demand Circuit Definition Parameters	page A-79
Bandwidth-on-Demand Congestion Monitor Parameters	page A-80
Bandwidth Allocation Protocol (BAP) Parameters	page A-86
BRI Configuration Parameters	page A-87
Outgoing Phone List Parameters	page A-90
Incoming Phone List Parameters	page A-100
Caller Resolution Table Parameters	page A-102

You can use Site Manager to edit all dial service parameters.You can also use the Technician Interface to modify parameters by issuing **set** and **commit** commands with the Management Information Base (MIB) object ID. This process is the same as modifying parameters using Site Manager. For more information about using the Technician Interface to access the MIB, refer to *Using Technician Interface Software*.

Caution: The Technician Interface does not verify that the value you enter for a parameter is valid. Entering an invalid value can corrupt your configuration.

Each parameter description begins with the Site Manager path that leads to the parameter. Each path assumes that you begin at the Configuration Manager window.

Two of the windows apply to all three dial services; the names of these windows have been shortened to make the paths easier to follow (see Table A-2).

Table A-2. Abbreviated Site Manager Window Titles

Full Name	Abbreviated Name
Demand Pools, Backup Pools, Bandwidth-On-Demand Pools	Pools
Demand Lines Definition, Backup Lines Definition, Bandwidth-On-Demand Lines Definition	Lines Definition

Pool ID Parameter

Parameter:	**Demand/Backup/Bandwidth Pool ID**
Path:	Dialup > Demand/Backup/Bandwidth On Demand Pools > Pools > **Add** > Demand/Backup/Bandwidth On Demand Pool Configuration
Default:	None
Options:	1 to 255
Function:	Identifies the line pool by assigning it a number.
Instructions:	Enter a number between 1 and 255, inclusive, as the line pool ID.
MIB Object ID:	1.3.6.1.4.1.18.3.5.1.4.5.1.6 (Demand Pool ID) 1.3.6.1.4.1.18.3.5.1.4.5.1.5 (Backup Pool ID) 1.3.6.1.4.1.18.3.5.1.4.5.1.35 (Bandwidth Pool ID)

WAN Serial Interface Type Parameter

Parameter:	**WAN Serial Interface Type**
Path:	Dialup > Demand/Backup/Bandwidth on Demand Pools > Pools > **Add** > Demand/Backup/Bandwidth on Demand Pool Configuration > **OK** > Lines Definition > **COM** Connector > Choose Wan Serial Interface Type
Default:	Sync
Options:	Sync | Async | Pasync (not applicable for dial services)
Function:	Determines whether this interface uses synchronous communication or asynchronous communication.
Instructions:	If you are using asynchronous PPP, select Async. Otherwise, accept the default.
MIB Object ID:	1.3.6.1.4.1.18.3.4.5.1.109

Sync and Async Line Media Type Parameters

Parameter: Line Media Type

Path: Dialup > Demand/Backup/Bandwidth on Demand Pools > Pools > **Add** > Demand/Backup/Bandwidth on Demand Pool Configuration > **OK** > Lines Definition > **COM** Connector > Choose Wan Serial Interface Type > **OK** > Sync or Async Line Media Type

Default: Raise DTR

Options: Raise DTR | V25bis | Hayes

Function: Specifies the signaling method that the router uses to interact with the modem.

Instructions: Choose one of the following:

Raise DTR -- A signaling method that enables access to the network by preprogramming the destination phone numbers into the dial device. Raise DTR signaling works with any of these interfaces: X.21, V.35, RS-232, and RS-422.

V.25bis -- A signaling method that enables access to the network by passing the destination phone numbers from the router to the dial device. Using V.25bis, the dial device can support dial connections to multiple destinations. V.25bis signaling works with any of these interfaces: X.21, V.35, RS-232, and RS-422.

Hayes -- A signaling method that enables access to the network by passing the destination phone numbers from the router to the dial device. Hayes signaling is for asynchronous PPP and works with RS-422 and V.34 interfaces. To use Hayes as the line media type, you must also specify a modem initialization string. The router sends this string to the modem to initiate a call.

MIB Object ID: 1.3.6.1.4.1.18.3.4.5.1.54

Parameter: **Cable Type**

Path: Dialup > Demand/Backup/Bandwidth on Demand Pools > Pools > **Add** > Demand/Backup/Bandwidth on Demand Pool Configuration > **OK** > Lines Definition > **COM** Connector > Choose Wan Serial Interface Type > **OK** > Sync Line Media Type

Default: RS232

Options: NULL | RS232 | RS422 | V35 | X21

Function: Indicates the physical interface type supported by the attached dial device. This parameter is for synchronous interfaces only.

Instructions: Select the option that corresponds to the interface type supported by the attached dial device.

MIB Object ID: 1.3.6.1.4.1.18.3.4.5.1.83

Parameter: **Priority**

Path: Dialup > Demand/Backup/Bandwidth on Demand Pools > Pools > **Add** > Demand/Backup/Bandwidth on Demand Pool Configuration > **OK** > Lines Definition > **COM** Connector > Choose Wan Serial Interface Type > **OK** > Sync or Async Line Media Type

Default: 1

Options: 1 to 50

Function: Prioritizes a group of lines in the same pool. For example, the router uses a line of priority 1 before it uses a line of priority 2.

For dial backup and bandwidth-on-demand pools, lines can reside across slots, but when you set this parameter, it affects only lines on the same slot. For example, if the backup pool has two lines in slot 3 and three lines in slot 4, the router sets a priority between the lines in slot 3, then sets a priority between the lines in slot 4. For bandwidth-on-demand, the router prioritizes lines in the preferred slot, then the reserved slot, and finally, the local slot.

Instructions: Assign a number to each line in the pool. The lower the number, the higher the priority. For pools that combine modem and ISDN lines, coordinate the priority assignments for this interface with those you set using the Pool Channel Priority parameter for the ISDN interface.

MIB Object ID: 1.3.6.1.4.1.18.3.4.5.1.97

External Modem Parameters

Parameter: **Retry Delay**

Path: **COM** Connector > **Edit Modem** > Sync/Async Modem Interface or Async Hayes Modem Interface

Default: 3 seconds

Options: 0 to infinity

Function: Specifies the number of seconds the router waits between attempts to reestablish the connection.

Instructions: Enter the number of seconds you want the router to wait between retry attempts.

MIB Object ID: 1.3.6.1.4.1.18.3.5.9.8.1.1.10

Parameter: **Redial Count**

Path: **COM** Connector > **Edit Modem** > Sync/Async Modem Interface or Async Hayes Modem Interface

Default: 3

Options: 1 to 10

Function: Specifies the maximum number of times that the router can attempt to connect to a dial-up line before it is disconnected.

Instructions: Select a number between 1 and 10, inclusive.

MIB Object ID: 1.3.6.1.4.1.18.3.5.9.8.1.1.16

Parameter: **Ring Indicator**

Path: **COM** Connector > **Edit Modem** > Sync/Async Modem Interface

Default: Enable

Options: Enable | Disable

Function: Enables or disables the Ring Indicator (RI) signal for Raise DTR signaling.

Instructions: If the dial-on-demand line is configured to use Raise DTR, and you have a Series 5 router running 7.60 software, set this parameter to Disable. Hardware versions earlier than 7.60 do not support RI. Otherwise, accept the default, Enable.

MIB Object ID: 1.3.6.1.4.1.18.3.5.9.8.1.1.28

Parameter: **Debug Mode**

Path: **COM** Connector > **Edit Modem** > Sync/Async Modem Interface or Async Hayes Modem Interface

Default: Disable

Options: Enable │ Disable

Function: Allows you to print debug log messages concerning the V.25bis, Raise DTR, or Hayes connection setup.

Instructions: Select Enable if you want to see the debug log messages. If not, accept the default, Disable.

MIB Object ID: 1.3.6.1.4.1.18.3.5.9.8.1.1.29

Parameter: **Modem Type**

Path: **COM** Connector > **Edit Modem** > Async Hayes Modem Interface

Default: Custom

Options: List of supported modems. Click on Values to see the list.

Function: Lets you specify the modem you are using in your network.

Instructions: Select one of the modems from the list. If the modem you are using is not listed, select Custom and be sure to enter a modem initialization string. If you do not enter a string, Site Manager prompts you to do so.

MIB Object ID: 1.3.6.1.4.1.18.3.4.29.1.1.21

Parameter: **Modem Command String**

Path: **COM** Connector > **Edit Modem** > Sync/Async Modem Interface or Async Line Media Type

OR

Dialup > Pools > Demand/Backup/Bandwidth on Demand Pools > **Add** > Demand/Backup/Bandwidth on Demand Pool Configuration > **OK** > Lines Definition > **COM** Connector > Choose Wan Serial Interface Type > **OK** > Sync or Async Line Media Type

Default: None

Options: Any valid modem command string (Raise DTR and V.25bis only).

Function: Enables you to test and modify the configuration of your modem. For example, if you want to change the speed of your modem, you can enter a command string to do this. Also, if you are having trouble placing calls, enter a string to test whether the modem responds.

Instructions: Enter a command string that your modem supports.

MIB Object ID: 1.3.6.1.4.1.18.3.5.9.8.13.1.4

Parameter: **Modem Init String**

Path: **COM** Connector > **Edit Modem** > Async Hayes Modem Interface

Default: AT& F

Options: An AT modem command string, which is an ASCII text string from 3 to 34 characters.

Function: For asynchronous interfaces only, this parameter specifies the modem initialization string the router sends to the modem. This command string takes precedence over factory default commands.

Instructions: Enter an AT command string that the modem should use to make calls. You must enter a value for this parameter if you selected Custom as the modem type. If you fail to enter a value, Site Manager prompts you to do so. Appendix E provides a summary of AT commands for the ARN. Refer to the manual for your modem for valid AT commands. Entering an invalid command may disable the modem. If the modem does not initialize, you may need to change the asynchronous baud rate. To do this, click on the COM connector and select Edit Line. Modify the value of the asynchronous baud rate.

MIB Object ID: 1.3.6.1.4.1.18.3.4.29.1.1.9

Parameter: **Speaker Volume**

Path: **COM** Connector > **Edit Modem** > Async Hayes Modem Interface

Default: Medium

Options: Low | Medium | High

Function: Sets the volume of the modem speaker. This parameter is available only if you select a modem from the list that Site Manager provides.

Instructions: Set the volume to Low, Medium, or High.

MIB Object ID: Not applicable

Parameter: **Speaker Control**

Path: **COM** Connector > **Edit Modem** > Async Hayes Modem Interface

Default: On For Call

Options: Off | On For Call | Always On | On For Answer

Function: Controls the modem speaker. This parameter is available only if you select a modem from the list that Site Manager provides.

Instructions: Select one of the following:

Off -- Turns the speaker off entirely

On For Call -- Turns the speaker on only when a call is established, and turns it off when the modem is transmitting data

Always On -- Keeps the modem speaker on at all times

On For Answer -- Turns the speaker on only when the modem is answering a call, and turns it off when the modem is transmitting data

MIB Object ID: Not applicable

Parameter:	**No. of Rings to Answer**
Path:	**COM** Connector > **Edit Modem** > Async Hayes Modem Interface
Default:	0
Options:	0 to 255
Function:	Determines the number of rings the router allows to connect to the modem. This parameter is available only if you select a modem from the list that Site Manager provides.
Instructions:	Enter an integer indicating the number of rings the router allows. For some modems, the modem may not answer after one ring, so you may want to set this value for two rings or more.
MIB Object ID:	Not applicable

V.34 Modem Parameters

These parameters are available only for the ARN using the V.34 Modem Adapter Module.

Parameter: Expert Config

Path: **COM** Connector > **Edit Modem** > Edit V.34 Modem Interface Parameters

Default: Disabled

Options: Enabled | Disabled

Function: Enables or disables configuration of the Modem Config String parameter.

Instructions: To use only the factory default configuration, leave this set to Disabled. Set to Enabled to enter an AT command string in the Modem Config String field.

MIB Object ID: Not applicable

Parameter: Modem Config String

Path: **COM** Connector > **Edit Modem** > Edit V.34 Modem Interface Parameters

Default: None

Options: An ASCII text string of 3 to 34 characters.

Function: Specifies a modem initialization string to be sent to the modem *after* the default, factory-configured command string. Commands in this string take precedence over commands in the factory default string (AT&M2&Q2&D0&S1&R0S0=0M1L2T).

Instructions: Enter an AT command string. Refer to Appendix E for a list of AT commands.

Note that entering an invalid command string could disable the modem. Site Manager can verify AT command string changes only when in dynamic mode.

MIB Object ID: 1.3.6.1.4.1.18.3.4.29.1.1.9

Parameter: **Modem Factory Defaults**

Path: **COM** Connector > **Edit Modem** > Edit V.34 Modem Interface Parameters

Default: Enabled

Options: Enabled | Disabled

Function: Specifies whether exclusive use of the factory default modem initialization string is enabled or disabled. When enabled, the router sends only the default string (ATT&d0&k3&X0S0=2S2=43) to the modem. When disabled, the router sends a user-specified initialization string (set in the Modem Config String parameter) after sending the default string. Commands in the user-specified string take precedence over the factory default command string.

Instructions: Enable or disable the exclusive use of the factory default modem initialization string.

MIB Object ID: 1.3.6.1.4.1.18.3.4.29.1.1.8

Parameter: **Originate/Answer**

Path: Configuration Manager > **COM** Connector > **Edit Modem** > Edit V.34 Modem Interface Parameters

Default: Originate

Options: Originate | Answer

Function: Determines whether the modem answers or originates calls.

Instructions: Set the modem to answer or originate calls.

MIB Object ID: Not applicable

Parameter: **Phone Number**

Path: **COM** Connector > **Edit Modem** > Edit V.34 Modem Interface Parameters

Default: None

Options: An ASCII text string.

Function: Specifies the number to dial for calls that the modem originates.

Instructions: Enter a complete dial-out phone number, including applicable country and area codes. Valid dial modifiers are the comma, exclamation point, ampersand (&), hyphen, and parenthesis.

MIB Object ID: 1.3.6.1.4.1.18.3.4.29.1.1.18

Parameter: **Speaker Volume**

Path: **COM** Connector > **Edit Modem** > Edit V.34 Modem Interface Parameters

Default: Medium

Options: Low | Medium | High

Function: Sets the volume of the modem speaker or disables the speaker.

Instructions: Turn the modem speaker off or set the volume to Low, Medium, or High.

MIB Object ID: Not applicable

Parameter: **Speaker Control**

Path: **COM** Connector > **Edit Modem** > Edit V.34 Modem Interface Parameters

Default: On For Call

Options: Off | On For Call | Always On | On For Answer

Function: Controls the modem speaker.

Instructions: Select one of the following:

Off -- Turns the speaker off entirely

On For Call -- Turns the speaker on only when a call is established, and turns it off when the modem is transmitting data

Always On -- Keeps the modem speaker on at all times

On For Answering -- Turns the speaker on only when the modem is answering a call, and turns it off when the modem is transmitting data

MIB Object ID: Not applicable

Parameter: **Set Pulse/Tone Dial Default**

Path: **COM** Connector > **Edit Modem** > Edit V.34 Modem Interface Parameters

Default: Tone

Options: Pulse | Tone

Function: Selects pulse or tone signals for the modem.

Instructions: Select Pulse only if your telephone line does not support tone dialing.

MIB Object ID: Not applicable

BRI Port Application Mode Parameter

Parameter: **Port Application Mode**

Path: Configuration Manager > **ISDN Connector** > Port Application

Default: Dialup – 2B+D

Options: Dialup – 2B+D │ Dialup – 1B+D │ Dialup – Floating B │ Leased – 2X64K │ Leased – 1X64K │ Leased – 128K

Function: Determines how the BRI service operates. The options are as follows:

Dialup – 2B+D: Specifies that this is an ISDN switched line that provides two B channels, and call setup occurs between the router and an ISDN switch.

Dialup – 1B+D: Specifies that this is an ISDN switched line that provides only one B channel, and call setup occurs between the router and an ISDN switch. Use this option when you do not need to use two B channels.

Dialup – Floating B: Only for AN, ANH, and ARN routers. Specifies that although this is an ISDN switched line providing two B channels, the software makes the necessary adjustments if only one channel is in use. Use this option if you can purchase only 2B + D service, but only want to use one B channel, or your application requires two synchronous ports and only one B channel.

Leased – 2X64K: Specifies that this line provides two B channels that are always available. No call setup occurs with an ISDN switch. Instead, the switch has a defined point-to-point connection between two ISDN end points (Germany and Japan only).

Leased – 1X64K: Specifies that this line provides one B channel that is always available. No call setup occurs with an ISDN switch. Instead, the switch has a defined point-to-point connection between two ISDN end points (Germany and Japan only).

Leased 128K: Specifies that this line provides one B channel that is always available. (The extra bandwidth of the 128 Kb/s channel is equivalent to having two B channels of 64 Kb/s.) No call setup occurs with an ISDN switch. Instead, the switch has a defined point-to-point connection between two ISDN end points (Germany and Japan only).

Instructions: If you have a dial-up application, choose one of the dial-up options.

For networks in Germany and Japan, if you want to have the dial-up line up at all times and your ISDN switch can support permanent connections, select one of the leased options.

MIB Object ID: 1.3.6.1.4.1.18.3.5.9.8.9.1.34

PRI Port Application Mode Parameter

Parameter:	**Port Application Mode**
Path:	**MCT1 or MCE1 Connector** > Port Application
Default:	NonPRI
Options:	NonPRI | PRI
Function:	Determines if this port is for PRI service. The NonPRI option indicates that this is a standard synchronous interface. The PRI option indicates that this is a PRI port.
Instructions:	If your application calls for PRI, select PRI. Otherwise, accept the default.
MIB Object ID:	1.3.6.1.4.1.18.3.4.9.3.1.16

ISDN Switch Parameters

Parameter:	**Switch Type**
Path:	Dialup > Demand/Backup/Bandwidth On Demand Pools > Pools > **Add** > Demand/Backup/Bandwidth On Demand Pool Configuration > **OK** > Lines Definition > **ISDN/MCT1/MCE1** Connector > ISDN Switch Configuration
Default:	BRI NET3 | PRI Net5
Options:	BRI NET3 | BRI SWISSNET3 | BRI 5ESS | BRI DMS100 | BRI KDD | BRI NTT | BRI TS013 | BRI NI1 | PRI 5ESS | PRI DMS100 | PRI 4ESS | PRI KDD | PRI NTT | PRI Net5 | PRI TS014 Site Manager displays only those switch options for the interface you are configuring. For example, if you are setting up BRI service, you will see only BRI switch types when you click on Values. In addition, if the router is communicating with a Version 8.10 router, you will only see BRI switch types that support Version 8.10 software.
Function:	Specifies the type of ISDN switch to which you are connecting.
Instructions:	Choose the appropriate ISDN switch. Refer to Table A-3 on A-17. On the ASN, you cannot configure two different switch types on the same slot.
MIB Object ID:	1.3.6.1.4.1.18.3.5.9.8.6.1.3

Table A-3. Switch Types by Country

Country	BRI Switch Types	PRI Switch Types
Austria Belgium Denmark France Germany Italy Netherlands Norway Spain Sweden United Kingdom	BRI NET3	PRI NET 5
Switzerland	BRI SWISSNET3	PRI NET 5
United States	BRI 5ESS, BRI NI1, BRI DMS100	PRI 4ESS, PRI 5ESS, PRI DMS 100
Canada	BRI NI1, BRI DMS100	PRI DMS100
Japan	BRI KDD, BRI NTT	PRI KDD, PRI NTT
Australia	BRI TS013	PRI TS014
Finland Greece Iceland Ireland Luxembourg Portugal		PRI NET 5

Parameter: **Incoming Filter**

Path: Dialup > Demand/Backup/Bandwidth on Demand Pools > Pools > **Add** > Demand/Backup/Bandwidth on Demand Pool Configuration > **OK** > Lines Definition > **ISDN/MCT1/MCE1** Connector > ISDN Switch Configuration

Default: Disable

Options: Enable | Disable

Function: The incoming filter enables you to use the security feature caller ID. It compares the phone number of the calling party with the phone numbers you entered in the incoming phone list, described in Chapter 12. You must purchase caller ID service so that the provider includes the calling party's number in the call setup message.

Instructions: Enable this parameter if you want the router to filter all incoming calls based on the calling party's number. Disable this parameter if the router should not screen calls or if the switch does not include the calling party's number in the incoming call.

MIB Object ID: 1.3.6.1.4.1.18.3.5.9.8.6.1.5

Parameter: **Sending Complete IE**

Path: Dialup > Demand/Backup/Bandwidth on Demand Pools > Pools > **Add** > Demand/Backup/Bandwidth on Demand Pool Configuration > **OK** > Lines Definition > **ISDN/MCT1/MCE1** Connector > ISDN Switch Configuration

Default: Disable

Options: Enable | Disable

Function: Instructs the router to include the sending complete information element (IE) in the outgoing call setup message to the switch. The sending complete IE is a number that the router includes in the call setup message to indicate that the setup is complete and no other setup information will follow. There are some switches that rely on this information during call setup.

Instructions: Select Enable if you want to include this IE in the call setup message, and if your ISDN switch supports this IE. By including the IE in the call setup message, call setup times may be faster. If your ISDN switch does not support this IE, accept the default, Disable.

MIB Object ID: 1.3.6.1.4.1.18.3.5.9.8.6.1.8

Parameter: **Global Adaption Rate**

Path: Dialup > Demand/Backup/Bandwidth on Demand Pools > Pools > **Add** > Demand/Backup/Bandwidth on Demand Pool Configuration > **OK** > Lines Definition > **ISDN/MCT1/MCE1** Connector > ISDN Switch Configuration

Default: 64K

Options: 64K │ 56K

Function: In accordance with the ITU-T V.110 standard, this parameter enables the router to send and receive data transmitting at a rate of 56 Kb/s and adapt it for transmission over a 64 Kb/s line.

Instructions: Specify the rate that the router sends and receives calls over a B channel. Ensure that the rate is compatible with the network connections to the destination device. Ask your provider if you are unsure.

If the value of this parameter is greater than the value of the outgoing call's Adaption Rate parameter, the router ignores this parameter and uses the outgoing call's data rate. For example, if this parameter is set to 64 Kb/s, and the Adaption Rate parameter is set to 56 Kb/s, the router uses the rate of 56 Kb/s for the outgoing call. If the parameter values are equal, or if only this parameter is set, the router uses this value and ignores the outgoing call's value. If no value is set for either parameter, the router uses the default, 64 Kb/s.

MIB Object ID: I 1.3.6.1.4.1.18.3.5.9.8.6.1.9

Parameter: **Global X.25 over ISDN-D Channel**

Path: Dialup > Edit Switch Parameters > ISDN Configured Switches

Default: Disable

Options: Enable │ Disable

Function: Globally enables or disables X.25 service over the D channel for a slot on the router.

Instructions: Site Manager automatically sets this parameter to Enable when you configure X.25 service over the D channel for a BRI line. Refer to page A-24 for the parameter that enables this feature for the BRI line.

Select Disable to disable this service for a slot.

MIB Object ID: 1.3.6.1.4.1.18.3.5.9.8.6.1.10

Pool Channel Count and Priority Parameters

Parameter: **Pool Channel Count**

Path: Dialup > Demand/Backup/Bandwidth on Demand Pools > Pools > **Add** > Demand/Backup/Bandwidth on Demand Pool Configuration > **OK** > Lines Definition > **ISDN/MCT1/MCE1** Connector > ISDN Switch Configuration > **OK** > ISDN Logical Lines

OR

Dialup > Demand/Backup/Bandwidth on Demand Pools > Pools > **select pool** > **Edit** > Lines Definition > **ISDN/MCT1/MCE1** Connector > ISDN Logical Lines

Default: Available B channels

Options: 1 to 2 (BRI) │ 1 to 23 (PRI – MCT1) │ 1 to 30 (PRI – MCE1)

The channel-count range for PRI depends on the number of B channels you selected in the Timeslots window and the number out of this total that you assign to each pool. For example, if you have a total of 20 B channels, and five of those channels are configured for Pool 1, the range of this parameter for Pool 2 is 1 to 15 channels. Five of the original 20 channels are not available because they are used by Pool 1.

Function: Determines the number of B channels in the line pool.

Instructions: Enter the number of B channels that you want in the line pool.

If you are configuring a multirate call, be sure that the value for this parameter is not less than the maximum value that you can set for the Aggregate Bandwidth parameter, which you configure when you set up an outgoing phone list. For example, if the aggregate bandwidth is 256 Kb/s, the value for this parameter should be 4.

MIB Object ID: 1.3.6.1.4.1.18.3.5.9.8.11.1.5

Parameter: Pool Channel Priority

Path: Dialup > Demand/Backup/Bandwidth on Demand Pools > Pools > **Add** > Demand/Backup/Bandwidth on Demand Pool Configuration > **OK** > Lines Definition > **ISDN/MCT1/MCE1** Connector > ISDN Configured Switches > **OK** > ISDN Logical Lines

OR

Dialup > Demand/Backup/Bandwidth on Demand Pools > Pools > **select pool** > **Edit** > Lines Definition > **ISDN/MCT1/MCE1** Connector > ISDN Logical Lines

Default: 1

Options: 1 to 50

Function: Prioritizes a group of lines in a pool. For example, the router uses a line of priority 1 before it uses a line of priority 2.

For dial backup and bandwidth-on-demand pools, lines can reside across slots, but when you set this parameter, it affects only lines on the same slot. For example, if the backup pool has two lines in slot 3 and three lines in slot 4, the router sets a priority for the lines in slot 3, then sets a priority for the lines in slot 4. For the bandwidth pool, the router prioritizes lines in the preferred slot, then the reserved slot, and finally, the local slot.

Instructions: Assign a number to each line in the pool. The lower the number, the higher the priority. If you have a pool that combines modem and ISDN lines, you should coordinate the priority assignments for the ISDN lines with those you set using the Priority parameter for the modem lines.

MIB Object ID: 1.3.6.1.4.1.18.3.5.9.8.11.1.6

BRI Configuration Parameters

Parameter: **Acceptable LAPD MTUs**

Path: Configuration Manager **> ISDN Connector** > ISDN Dialup > **Edit D Chan** > BRI Interface Configuration

Default: 400 bytes

Options: 3 to 1024 bytes

Function: Specifies the maximum number of bytes per LAPD transmission unit.

Instructions: Enter a value for the maximum MTUs. We recommend that you accept the default, 400 bytes.

MIB Object ID: 1.3.6.1.4.1.18.3.5.9.8.9.1.12

Parameter: **BRI T3 Timer**

Path: **ISDN Connector** > ISDN Dialup > **Edit D Chan** > BRI Interface Configuration

Default: 10 seconds

Options: 1 to 30 seconds

Function: Indicates the amount of time that the router has to try and activate the ISDN S/T or U interface (ARN only). The router starts this timer while the ISDN interface is deactivated and the router tries to activate it, for example, when the router wants to send data. During this period, the router sends INFO 1 frames across the ISDN interface until the network responds with a signal or the timer expires. This timer prevents the router from attempting to activate the ISDN interface interminably.

Instructions: Enter a time limit that is sufficient for the router to activate the ISDN S/T or U interface. This value should be greater than the time it would take to activate the ISDN interface under normal conditions. You may want to ask your ISDN provider for guidelines regarding the subscriber loop transmission, which might affect the value you enter.

MIB Object ID: 1.3.6.1.4.1.18.3.5.9.8.9.1.14

Parameter: **BRI T4 Timer**

Path: **ISDN Connector** > ISDN Dialup > **Edit D Chan** > BRI Interface Configuration

Default: 750 milliseconds

Options: 500 to 1000 milliseconds

Function: Indicates the amount of time the router waits for the line to recover from a deactivated state. This timer prevents brief, minor disturbances on a noisy line from forcing the router to deactivate the circuit. Instead, the router waits to see if the line recovers within the T4 timer period. This enables the router to suppress minor line problems from the upper-layer protocols.

Instructions: Enter a time limit that the router waits for the line to recover before it deactivates the circuit. If your line is noisy, enter the maximum time for the router to wait for the line to reactivate.

MIB Object ID: 1.3.6.1.4.1.18.3.5.9.8.9.1.15

Parameter: **BRI B Channel Loopback**

Path: **ISDN Connector** > ISDN Dialup > **Edit D Chan** > BRI Interface Configuration

Default: Disable

Options: Enable │ Disable

Function: This parameter is for Layer 1 ISDN BRI conformance testing. It allows the external equipment to send data to the router over the B channels and loop it right back out the S/T or U interface (ARN only). The external equipment can verify its physical connection to the router.

Instructions: Select Enable if you want to run a loopback test between the network and the S/T or U interface on the router. Do not enable this parameter when the router is in normal operational mode.

MIB Object ID: 1.3.6.1.4.1.18.3.5.9.8.9.1.13

Parameter: **BRI Line Type**

Path: **ISDN Connector** > ISDN Dialup > **Edit D Chan** > BRI Interface Configuration

Default: PTP

Options: PTP │ MTP

Function: Indicates whether you have a point-to-point (PTP) or multipoint (MTP) configuration on the BRI line.

Instructions: Enter the value of the type of line supplied by your ISDN provider. If you have a PTP line connected to a 5ESS switch, you do not have to configure SPIDs. (Refer to the SPID parameter on page A-88.)

MIB Object ID: 1.3.6.1.4.1.18.3.5.9.8.9.1.33

Parameter: **X.25 over ISDN-D Channel**

Path: **ISDN Connector** > ISDN Dialup > **Edit D Chan** > BRI Interface Configuration

Default: Disable

Options: Enable │ Disable

Function: Enables or disables X.25 service over the D channel for each BRI line.

Instructions: Select Enable to enable this feature. Otherwise, accept the default.

CAUTION: If you enable or disable this feature dynamically, the router disconnects all existing calls over the B channels as the ISDN software makes changes for the feature. Once the changes are complete, the software restarts and you can make calls again.

MIB Object ID: 1.3.6.1.4.1.18.3.5.9.8.9.1.39

Parameter: **TEI Type for X.25 over ISDN-D**

Path: **ISDN Connector** > ISDN Dialup > **Edit D Chan** > BRI Interface Configuration

Default: Fixed

Options: Fixed | Auto

Function: Specifies how you choose to configure the TEI value for the DTE. You can preassign the identifier value at the time you order ISDN service or the router can learn the value from the switch dynamically when you place a call and the line becomes active. Either way, the switch assigns this value. This parameter is available only if you enable X.25 over the D channel.

Instructions: Select Fixed to enter the identifier assigned by the switch before placing any calls. Select Auto so the router learns the identifier dynamically once the line is active.

MIB Object ID: 1.3.6.1.4.1.18.3.5.9.8.9.1.40

Parameter: **TEI Value for X.25 over ISDN-D**

Path: **ISDN Connector** > ISDN Dialup > **Edit D Chan** > BRI Interface Configuration

Default: 1

Options: 0 to 63

Function: Assigns a number to the X.25 DTE to identify it to the ISDN switch. This parameter is available only if you enable X.25 over the D channel for a fixed TEI type.

Instructions: If you set the TEI type to Fixed, enter the TEI value that the switch provider assigned when you ordered ISDN service. The value must be in the range 0 to 63. If the TEI type is set to Auto, ignore this parameter.

MIB Object ID: 1.3.6.1.4.1.18.3.5.9.8.9.1.41

Demand Circuit Parameters (PPP and Frame Relay)

Parameter: Demand Pool ID

Path: Dialup > Demand Circuits > Demand Pools > **PPP or FR Circuits** > PPP or FR Demand Circuits

Default: None

Options: 1 to 255

Function: Identifies the demand pool associated with the demand circuit.

Instructions: Enter the ID number of the configured demand pool that you want this circuit to use.

MIB Object ID: 1.3.6.1.4.1.18.3.5.1.4.5.1.6

Parameter: Force Take Down

Path: Dialup > Demand Circuits > Demand Pools > **PPP or FR Circuits** > PPP or FR Demand Circuits

Default: Disable

Options: Enable | Disable

Function: Forces the router to immediately terminate the demand circuit.

Instructions: Accept the default, Disable, or select Enable to force the router to terminate the demand circuit.

MIB Object ID: 1.3.6.1.4.1.18.3.5.1.4.5.1.24

Parameter: Force Dial

Path: Dialup > Demand Circuits > Demand Pools > **PPP or FR Circuits** > PPP or FR Demand Circuits

Default: Disable

Options: Enable | Disable

Function: Forces the demand circuit connection to immediately activate.

Instructions: To force a demand circuit connection, select Enable, then reset it to Disable.

MIB Object ID: 1.3.6.1.4.1.18.3.5.1.4.5.1.9

Parameter: **Inactivity Time**

Path: Dialup > Demand Circuits > Demand Pools > **PPP or FR Circuits** > PPP or FR Demand Circuits

Default: 60 seconds

Options: 1 to 99,999,999 seconds

Function: Measures the data inactivity on the line. Specifically, it determines the number of seconds that can elapse *without* data activity before the router disconnects the line. Each time data passes through the router, the inactivity time resets.

NOTE: The router does not consider LQR, LCP, and periodic CHAP messages as data, so they do not reset the time.

This parameter and the Inactivity Mode parameter determine how inactivity is monitored. Once the router concludes that there is no data activity, it disconnects the line.

Instructions: Specify a time limit, between 1 and 99, 999,999 seconds, that the router waits before deactivating the switched connection.

If you want the connection to remain active at all times, enter 99,999,999. The connection remains active unless the network deactivates the connection. If the connection is deactivated, the router redials the same number when the next packet is ready for transmission. You can also manually force the router to establish a connection if a line is available.

MIB Object ID: 1.3.6.1.4.1.18.3.5.1.4.5.1.15

Parameter: **Retry Max**

Path: Dialup > Demand Circuits > Demand Pools > **PPP or FR Circuits** > PPP or FR Demand Circuits

Default: 2

Options: 1 to 10

Function: Specifies the number of attempts that the router makes to establish the circuit. The router tries all of the phone numbers in the outgoing phone list for a given line. If no connection is made and there is still data to send, the router increments the retry count, then retries these numbers on the next line in the pool.

Instructions: Enter the number of times you want the router to try to establish the circuit.

MIB Object ID: 1.3.6.1.4.1.18.3.5.1.4.5.1.25

Parameter: **Retry Delay**

Path: Dialup > Demand Circuits > Demand Pools > **PPP or FR Circuits** > PPP or FR Demand Circuits

Default: 3 seconds

Options: 1 to 60 seconds

Function: Determines how long the router waits between each retry attempt before trying to reestablish the circuit.

Instructions: Enter the amount of time that you want the router to wait before trying the next line in the pool. The amount of time you choose depends on the time it typically takes the network to recover.

MIB Object ID: 1.3.6.1.4.1.18.3.5.1.4.5.1.27

Parameter: **Connection Mode**

Path: Dialup > Demand Circuits > Demand Pools > **PPP or FR Circuits** > PPP or FR Demand Circuits

Default: Collision Master

Options: No Dial | Collision Master | Collision Slave

Function: Determines the role of each router when two routers try to establish a demand circuit with one another. Both routers in a demand configuration can initiate a call. This parameter determines which router places the call first to avoid continual collisions.

Instructions: To avoid continual collisions, configure one router as Collision Master and the other as Collision Slave. To ensure that a router receives calls, but never initiates calls, enter No Dial. Calls are then made only in one direction.

If this circuit is part of an unnumbered demand circuit group, the router automatically sets this parameter to No Dial because a circuit in a demand circuit group cannot initiate a call.

If you are configuring a bandwidth pool for this circuit, and this router is the monitor router, you can select Collision Master or Collision Slave.

MIB Object ID: 1.3.6.1.4.1.18.3.5.1.4.5.1.28

Parameter: **Auto Demand Termination**

Path: Dialup > Demand Circuits > Demand Pools > **PPP or FR Circuits** > PPP or FR Demand Circuits

Default: Disabled

Options: Enabled | Disabled

Function: For applications where there are two paths to the same destination, this parameter allows the router to automatically terminate a failed demand circuit and send the data over an alternate path to the destination. Note that the router does not terminate the circuit until it reaches the maximum number of connection attempts, which you specify in the Retry Max parameter.

Enable this parameter when the router continues to advertise a static route over a demand circuit, but it cannot establish a connection over that circuit. The router terminates the demand circuit, which notifies the routing protocol that the static routes associated with this circuit are no longer active. The router then uses the alternate path.

Instructions: Select Enable if you have an alternate path to a remote destination, and you want to ensure that if the demand circuit fails, the router terminates the circuit and sends data over the alternate path.

MIB Object ID: 1.3.6.1.4.1.18.3.5.1.4.5.1.29

Parameter: **Auto Demand Term. Reset**

Path: Dialup > Demand Circuits > Demand Pools > **PPP or FR Circuits** > PPP or FR Demand Circuits

Default: 60 minutes

Options: 1 to 999,999 minutes

Function: Specifies the amount of time, in minutes, that the router waits before reestablishing the demand circuit after an auto demand termination. Once the router reestablishes the demand circuit, the protocols readvertise the static routes for this demand circuit.

Instructions: Specify an amount of time that allows the network to recover or that allows your network administrator to resolve the problem. You must enter a value for this parameter if you configured the Auto Demand Termination parameter.

MIB Object ID: 1.3.6.1.4.1.18.3.5.1.4.5.1.30

Parameter: Circuit Name

Path: Dialup > Demand Circuits > Demand Pools > **PPP or FR Circuits** > PPP or FR Demand Circuits

Default: None

Options: Any valid demand circuit name.

Function: Identifies the name of the demand circuit.

Instructions: Site Manager supplies this name based on the available circuit names. To modify this parameter value, enter a new name, then click on Apply.

MIB Object ID: 1.3.6.1.4.1.18.3.3.2.3.1.3

Parameter: Dial Optimized Routing

Path: Dialup > Demand Circuits > Demand Pools > **PPP or FR Circuits** > PPP or FR Demand Circuits

Default: Disabled

Options: Disabled | Enabled

Function: Enables dial optimized routing for this interface.

Instructions: Select Enabled to exchange RIP or RIP/SAP updates only when a connection is active for data transmission or when the protocol makes an update request at the expiration of the Broadcast Timer (IP) or Update Interval (IPX). Routing updates alone cannot initiate connections. Accept the default, Disable, if you do not want to limit updates in this way.

If you enable or disable dial optimized routing dynamically while your demand connection is active, the router deactivates the connection. If there is still data to send after the call is cleared, the router places another call using the new value for this parameter.

If you do not enable dial optimized routing, you may want to limit routing updates using another method. Refer to Chapter 5 for more information about limiting broadcast traffic.

MIB Object ID: 1.3.6.1.4.1.18.3.5.1.4.5.1.47

Parameter: **Routing Update Hold Time**

Path: Dialup > Demand Circuits > Demand Pools > **FR Circuits** > FR Demand Circuits

Default: 0

Options: 0 to 600 seconds

Function: Tells the router how long to wait before sending RIP or SAP updates across the Frame Relay demand circuit. This parameter works together with dial optimized routing.

Instructions: If you enable dial optimized routing, enter the number of seconds that the router should wait after placing a call to send routing updates. The time interval you specify should be long enough so that the connection to the destination site activates, not just the connection to the Frame Relay switch. If you send routing updates before the connection to the destination is active, routing updates may not reach the destination.

MIB Object ID: 1.3.6.1.4.1.18.3.5.1.4.5.1.57

Standby Circuit Parameters (PPP Demand Circuits only)

Parameter: Standby Mode

Path: Dialup > Demand Circuits > Demand Pools > **PPP Circuits** > PPP Demand Circuits

Default: Demand Normal

Options: Demand Normal | Standby | Hot Standby

Function: Indicates whether this circuit operates as a demand circuit or a standby circuit.

Instructions: Accept the default if you want this circuit to operate as a demand circuit. Select Hot Standby if you want this circuit to back up a failed primary circuit. Select Standby to act as a standby circuit for incoming calls.

MIB Object ID: 1.3.6.1.4.1.18.3.5.1.4.5.1.50

Parameter: Standby Failback Mode

Path: Dialup > Demand Circuits > Demand Pools > **PPP Circuits** > PPP Demand Circuits

Default: None

Options: None | Automatic | Manual

Function: Controls the failback from the hot standby circuit to the primary circuit. This option is available only if the Standby Mode parameter is Hot Standby.

Instructions: Select one of the following options:

Automatic -- Automatically deactivates the hot standby circuit and sends data traffic back across the primary circuit when it recovers. This option takes precedence over any Time of Day schedule.

Manual -- Controls the primary and hot standby circuits by operator intervention. To return traffic to the primary circuit you manually deactivate the standby circuit. This option overrides the Time of Day schedule.

None -- Instructs the router to rely exclusively on the Time of Day schedule for primary and standby circuit operation and to ignore this parameter.

MIB Object ID: 1.3.6.1.4.1.18.3.5.1.4.5.1.51

Parameter: **Manual Standby Action**

Path: Dialup > Demand Circuits > Demand Pools > **PPP Circuits** > PPP Demand Circuits

Default: No Action

Options: No Action │ Activate │ Deactivate

Function: Allows you to manually control the standby circuit.

Instructions: Select Activate to activate a standby or hot standby circuit. Select Deactivate to bring down a standby circuit. Accept the default, No Action, if you do not want to manually activate a standby circuit.

MIB Object ID: 1.3.6.1.4.1.18.3.5.1.4.5.1.52

Parameter: **Standby Primary Circuit**

Path: Dialup > Demand Circuits > Demand Pools > **PPP Circuits** > PPP Demand Circuits

Default: None

Options: Circuit number of a leased line.

Function: Specifies the primary circuit that the hot standby circuit backs up. This option is available only if the Standby Mode parameter is Hot Standby.

Instructions: Click on the Values button. Site Manager displays a list of primary and bandwidth-on-demand circuits. Highlight the circuit for which standby service should be provided, then click on OK.

MIB Object ID: 1.3.6.1.4.1.18.3.5.1.4.5.1.4

Callback Parameters (PPP Demand Circuits only)

Parameter: Callback Mode

Path: Dialup > Demand Circuits > Demand Pools > **PPP Circuits** > PPP Demand Circuits

Default: Inactive

Options: Inactive │ Server │ Client │ Server Call ID │ Client One Charge │ Server One Charge │ Server One Charge Call ID

Note the following guidelines:

- If the router is set to Server, Client, or Server Call ID, the router performs CHAP or PAP authentication when it receives a call.
- The one-charge modes ensure that only the server side of the callback connection incurs phone charges. When you choose any of these options, the server refuses the call from the client, eliminating charges for the client's initial call, but charging the server for its return calls to the client.
- To use any of the one-charge modes, each remote site must have a unique phone number. The server must be able to identify a single circuit for each phone number that it calls back.
- If you want to reduce your configuration work and you can purchase caller ID service, select the modes that use Call ID. These modes do not require an outgoing phone list to place a call; they rely only on the phone number in the call setup message.
- If you cannot use caller ID or the phone number in the call setup message is not sufficient to place an outgoing call (for example, you have to dial 9 to get an outside line), do not select a Call ID mode.

Function: Determines the role of the router in relation to its peer router, and how the router identifies which phone number to call back.

Instructions: Select one of the following options:

Inactive -- Disables the callback feature for this circuit.

Server -- Designates the router as the callback server. The server receives a call from the client. It authenticates the caller, disconnects the call, and returns the call using a phone number in the outgoing phone list.

(continued)

(continued)

Instructions: **Client** -- Designates the router as the callback client. Use this mode when the other end of the connection uses Server or Server Call ID. The client initiates a call to the server, then waits for the server to return the call. Once it receives the return call, the client authenticates the call before accepting it.

Server Call ID (ISDN connections only) -- Designates the router as the callback server using caller ID. The server receives a call from the client, authenticates the call, and disconnects it. The server then returns the call using the phone number in the original call's setup message.

Client One Charge (ISDN connections only) -- Designates the router as the callback client. Also indicates that there will be no charge for the initial call to the server. Use this mode when the other end of the connection uses Server One Charge or Server Once Charge Call ID. The client places a call to the server, expecting the call to fail. The server refuses the call, which eliminates any phone charge for the client. The client then waits for a return call from the server. This option saves the client the cost of the initial call.

Server One Charge (ISDN connections only) -- Designates the router as the callback server. Also indicates that only the server will be charged for the return call to the client. The server receives a call from the client. The server, using incoming call filtering, verifies that the client is an authorized caller by matching the client's phone number with a phone number and circuit number in the incoming phone list. If the server finds a matching entry, it refuses the call. By refusing the call, the server eliminates any phone charges for the client. The server then returns the call using a phone number in its outgoing phone list for the matching circuit.

Server One Charge Call ID (ISDN connections only) -- Designates the router as the callback server using caller ID and indicates that only the server will be charged for the return call to the client. The server receives a call from the client. The server, using incoming call filtering, verifies that the client is an authorized caller by matching the client's phone number with a phone number and circuit number in the incoming phone list. If the server finds a matching entry, it refuses the call. By refusing the call, the server eliminates any phone charges for the client. The server then returns the call using the phone number in the original call's setup message.

MIB Object ID: I1.3.6.1.4.1.18.3.5.1.4.5.1.53

Parameter: Callback Server Delay Time (sec)

Path: Dialup > Demand Circuits > Demand Pools > **PPP Circuits** > PPP Demand Circuits

Default: 0

Options: 0 to 1800 seconds

Function: Specifies the amount of time the server waits before calling back the client. Delaying the call allows time for the client's modem to disconnect or for its ISDN connection to stop retrying the original call.

This parameter is available only if the Callback Mode parameter is set to one of the server options.

Instructions: Enter the amount of time you want the server to wait before calling the client back. If you are using a modem, enter a value greater than 6 seconds.

MIB Object ID: 1.3.6.1.4.1.18.3.5.1.4.5.1.54

Parameter: Callback Client Delay Time (sec)

Path: Dialup > Demand Circuits > Demand Pools > **PPP Circuits** > PPP Demand Circuits

Default: 5 seconds

Options: 0 to 1800 seconds

Function: Specifies the amount of time the client waits for a return call from the server. During this time, the client will not place an outgoing call to any other destination. The delay gives the server time to return the initial call.

This parameter is available only if the Callback Mode parameter is set to one of the client options.

Instructions: Enter the amount of time the client should wait for the server to call. This value must be greater than the Callback Server Delay Time. If you are dialing through a modem, we recommend that you set this value greater than 45 seconds.

MIB Object ID: 1.3.6.1.4.1.18.3.5.1.4.5.1.55

Authentication Protocol Parameters (Demand, Backup, Bandwidth)

The authentication parameters are the same for demand, backup, and bandwidth circuits, and they are located in each service's circuit configuration window.

Parameter: CHAP Local Name

Path: **Demand Circuits:** Dialup > Demand Circuits > Demand Pools > **PPP Circuits** > PPP Demand Circuits

Backup Circuits: Dialup > Backup Circuits > PPP > Primary Circuit Definition

Bandwidth Circuits: Dialup > Bandwidth On Demand Circuit > Bandwidth On Demand Circuit Definition

Default: None

Options: Any text string; maximum of 20 characters

Function: This name is part of the outbound call and it informs remote peer routers of the local router's identity.

For bandwidth-on-demand circuits, this parameter is only available if the Bandwidth Mode parameter is set to Monitor. The router uses the CHAP name when it activates the secondary line.

Instructions: If you configure CHAP as the authentication protocol, specify a name for router identification. If not, ignore this parameter. Do not configure this parameter for a demand circuit group.

MIB Object ID: 1.3.6.1.4.1.18.3.5.1.4.5.1.31

Parameter:	**CHAP Secret**
Path:	**Demand Circuits:** Dialup > Demand Circuits > Demand Pools > **PPP Circuits** > PPP Demand Circuits **Backup Circuits:** Dialup > Backup Circuits > PPP > Primary Circuit Definition **Bandwidth Circuits:** Dialup > Bandwidth On Demand Circuit > Bandwidth On Demand Circuit Definition
Default:	Unsecured
Options:	Any text string; maximum of 20 characters
Function:	Specifies the CHAP Secret that you assign to this interface. The CHAP secret is for identification and security purposes, and must be the same on both sides of the link. When one router places a call to another router, an authentication process takes place. During this phase, the routers send challenge packets back and forth that include the CHAP secret. Both routers on a link must have the same CHAP secret to correctly calculate responses to the challenges. For bandwidth-on-demand circuits, this parameter is only configurable if the bandwidth mode is Monitor. The router uses the CHAP secret when it brings up the secondary line.
Instructions:	If you configure CHAP as the authentication protocol, specify the CHAP secret. If not, ignore this parameter.
MIB Object ID:	1.3.6.1.4.1.18.3.5.1.4.5.1.32

Parameter: **PAP Local ID**

Path: **Demand Circuits:** Dialup > Demand Circuits > Demand Pools > **PPP Circuits** > PPP Demand Circuits

Backup Circuits: Dialup > Backup Circuits > PPP > Primary Circuit Definition

Bandwidth Circuits: Dialup > Bandwidth On Demand Circuit > Bandwidth On Demand Circuit Definition

Default: None

Options: Any text string; maximum of 25 characters

Function: Specifies the PAP ID that you assign to this interface. It identifies the calling router to the called router. During the authentication phase, all Password Authenticate-Request messages that the calling router sends to the called router must include the correct PAP ID or the called router sends an Authenticate-Negative Acknowledgment (Authenticate-NAK) and does not bring up the connection.

For bandwidth-on-demand circuits, this parameter is only configurable if the Bandwidth Mode parameter is set to Monitor.

Instructions: If you are using PAP as the authentication protocol, specify a unique PAP ID for this circuit. If not, ignore this parameter.

MIB Object ID: 1.3.6.1.4.1.18.3.5.1.4.5.1.37

Parameter:	**PAP Password**
Path:	**Demand Circuits:** Dialup > Demand Circuits > Demand Pools > **PPP Circuits** > PPP Demand Circuits **Backup Circuits:** Dialup > Backup Circuits > PPP > Primary Circuit Definition **Bandwidth Circuits:** Dialup > Bandwidth On Demand Circuit > Bandwidth On Demand Circuit Definition
Default:	Unsecured
Options:	Any text string; maximum of 25 characters
Function:	Specifies the PAP password that you assign to this interface. During the interface's authentication phase, all Password Authenticate-Request messages that the calling router sends to the called router must include the correct PAP password or the called router sends an Authenticate-Negative Acknowledgment (Authenticate-NAK) and does not bring up the connection. For bandwidth-on-demand circuits, this parameter is only configurable if the Bandwidth Mode parameter is set to Monitor.
Instructions:	If you are using PAP as the authentication protocol, specify a unique PAP password for this circuit. If not, ignore this parameter.
MIB Object ID:	1.3.6.1.4.1.18.3.5.1.4.5.1.38

Parameter:	**Outbound Authentication**
Path:	**Demand Circuits:** Dialup > Demand Circuits > Demand Pools > **PPP Circuits** > PPP Demand Circuits **Backup Circuits:** Dialup > Backup Circuits > PPP > Primary Circuit Definition **Bandwidth Circuits:** Dialup > Bandwidth On Demand Circuit > Bandwidth On Demand Circuit Definition
Default:	Enable
Options:	Enable | Disable
Function:	Specifies whether the router performs authentication when it places an outbound call. Disabling outbound authentication improves interoperability with devices that do not perform two-way authentication or support CHAP.
Instructions:	Accept the default, Enable, if you want to use two-way authentication, that is, both sides of the connection will authenticate the other's identity. Select Disable to use one-way authentication, which means that only the router receiving the call performs authentication. If you disable this parameter to use one-way authentication, you must enable the PPP Fallback parameter, which is part of the PPP interface configuration. Refer to *Configuring PPP Services* for information about PPP Fallback.
MIB Object ID:	1.3.6.1.4.1.18.3.5.1.4.5.1.48

Circuit Duration Parameters (Demand and Backup)

The circuit duration parameters determine how long the connection remains active. It does not determine the days and hours that the circuit is available.

Parameter: **Maximum Up Time**

Path: **Demand Circuits:** Dialup > Demand Circuits > Demand Pools > **PPP or FR Circuits** > PPP or FR Demand Circuits

Backup Circuits: Dialup > Backup Circuits > PPP or Frame Relay > Primary Circuit Definition or FR Primary Interface Definition

Default: 60 minutes

Options: 1 to 999,999 minutes

Function: Specifies the maximum duration of a call for a continuous period of time. This parameter value ensures that the connection is not up longer than necessary.

For example, you may configure the circuit's availability (via the Start and End time parameters) from 9:00 a.m. to 5:00 p.m. Then configure this parameter for 60 minutes. If the connection comes up at 10:00 a.m., the router keeps the circuit active until 11:00 a.m. Then, the router invokes the Max UpTime Termination parameter to deactivate the circuit.

Instructions: Enter the maximum active time for a call during a continuous period of time.

MIB Object ID: 1.3.6.1.4.1.18.3.5.1.4.5.1.10

Parameter: **Max UpTime Termination**

Path: **Demand Circuits:** Dialup > Demand Circuits > Demand Pools > **PPP or FR Circuits** > PPP or FR Demand Circuits

Backup Circuits: Dialup > Backup Circuits > PPP or Frame Relay > Primary Circuit Definition or FR Primary Interface Definition

Default: Disabled

Options: Enabled | Disabled

Function: Automatically deactivates the circuit if the call reaches the maximum time that you specify in the Maximum Up Time parameter. If the router receives data after the circuit is down, the router does not establish a demand connection.

Instructions: Enter Enable if you want the circuit to terminate upon reaching the maximum time limit for the call.

MIB Object ID: 1.3.6.1.4.1.18.3.5.1.4.5.1.33

Parameter: **UpTime Term. Reset**

Path: **Demand Circuits:** Dialup > Demand Circuits > Demand Pools > **PPP or FR Circuits** > PPP or FR Demand Circuits

Backup Circuits: Dialup > Backup Circuits > PPP or Frame Relay > Primary Circuit Definition or FR Primary Interface Definition

Default: 60 minutes

Options: 1 to 999,999 minutes

Function: Determines the amount of time the router waits before making the demand circuit available again after an uptime termination (Max UpTime Termination parameter). The circuit is not established at this point, but the next time the router receives data, the circuit will be available and the router can activate it.

The router invokes this timer only after an invoking the UpTime Termination parameter.

Instructions: Enter the time period that the router should wait before making the circuit available again. You must enter a value for this parameter if you configured the Max UpTime Termination parameter.

MIB Object ID: 1.3.6.1.4.1.18.3.5.1.4.5.1.34

Parameter: **Minimum Call Duration**

Path: **Demand Circuits:** Dialup > Demand Circuits > Demand Pools > **PPP or FR Circuits** > PPP or FR Demand Circuits

Default: 60 seconds

Options: 10 to 2,147,483,647

Function: Specifies the minimum amount of time that the connection remains active regardless of whether there is data traffic.

Instructions: Enter the minimum amount of time the connection should remain active. For dial optimized routing circuits, this timer should allow enough time to send all routing updates to the remote nodes in the network.

MIB Object ID: 1.3.6.1.4.1.18.3.5.1.4.5.1.45

Parameter:	**Inactivity Mode**
Path:	**Demand Circuits:** Dialup > Demand Circuits > Demand Pools > **PPP or FR Circuits** > PPP or FR Demand Circuits
Default:	Both Directions
Options:	Both Directions | Transmit Only | Receive Only | Either Direction
Function:	Measures data inactivity for a specific direction across a line. Specifically, it lets you decide in which direction the router determines inactivity. Together with the Inactivity Time parameter, this parameter informs the router to deactivate the connection if there is no data going in the specified direction. **NOTE:** The router does not consider the following as data, so it does not consider them when determining inactivity: PPP's LQR, LCP, periodic CHAP messages, Frame Relay DLCMI, and other signaling messages.
Instructions:	Select the option that best suits your application: **Both Directions** -- If the router does not receive data and does not transmit data, it terminates the connection. The inactivity has to be in both directions. **Transmit Only** -- If there is no data to transmit, the router terminates the connection. The router disregards data it receives. Select this option if you are using dial optimized routing for IPX. **Receive Only** -- If the router does not receive data, it terminates the connection. The router disregards data it transmits. **Either Direction** -- If the router does not receive or transmit data, it terminates the connection. The inactivity can be in either direction.
MIB Object ID:	1.3.6.1.4.1.18.3.5.1.4.5.1.46

Circuit Schedule Parameters (Demand and Dial Backup)

Parameter: Days

Path: **Demand Circuits:** Dialup > Demand Circuits **>** Demand Pools> **PPP** or **FR Circuits >** PPP or FR Demand Circuits **> Schedule >** Circuit Time of Day Schedule or Pool Availability List > **Add** > Circuit Time of Day Schedule

Backup Circuits: Dialup > Backup Circuits > PPP or Frame Relay > Primary Circuit Definition or FR Primary Interface Definition > **Schedule** > Circuit Time of Day Schedule > **Add >** Circuit Time of Day Schedule

Default: Weekday

Options: Monday through Sunday │ Weekday │ Weekend

Function: Specifies the days that this circuit should be available. The router uses this parameter together with the Start Time and End Time parameters to create a time period that the circuit can be available.

Instructions: Enter a specific day of the week; enter Weekday for the entire week; enter Weekend for the entire weekend. Note that individual days of the week take precedence over the Weekday option.

For example, the router will provide a circuit scheduled for Monday between 9 a.m. and 11 a.m. before it provides a circuit scheduled for a weekday between 8 a.m. and 12 noon.

MIB Object ID: 1.3.6.1.4.1.18.3.5.1.4.11.1.4

Parameter: Start Time

Path: **Demand Circuits:** Dialup > Demand Circuits **>** Demand Pools> **PPP** or **FR Circuits >** PPP or FR Demand Circuits **> Schedule >** Circuit Time of Day Schedule or Pool Availability List > **Add** > Circuit Time of Day Schedule

Backup Circuits: Dialup > Backup Circuits > PPP or Frame Relay > Primary Circuit Definition or FR Primary Interface Definition> **Schedule** > Circuit Time of Day Schedule > **Add >** Circuit Time of Day Schedule

Default: 0

Options: 0 to 2400

Function: Specifies the time of day the demand or backup circuit is available. The router uses this parameter and the End Time parameter to establish a time period when the circuit is available. This parameter also specifies the time of day any secondary lines are available if you configure bandwidth-on-demand service for a PPP demand circuit.

Instructions: Enter an hour of the day, using the 24-hour-system of expressing time. For example, to activate the circuit at 5:00 p.m., enter 1700.

For the router to activate the circuit at the configured start time, ensure that the Availability Mode parameter is set to the default, Available. If you do not want the router to activate the circuit at the start time, set the Availability Mode to Not Available.

MIB Object ID: 1.3.6.1.4.1.18.3.5.1.4.11.1.5

Parameter: **End Time**

Path: **Demand Circuits:** Dialup > Demand Circuits **>** Demand Pools> **PPP** or **FR Circuits >** PPP or FR Demand Circuits **> Schedule >** Circuit Time of Day Schedule or Pool Availability List > **Add** > Circuit Time of Day Schedule

Backup Circuits: Dialup > Backup Circuits > PPP or Frame Relay > Primary Circuit Definition or FR Primary Interface Definition> **Schedule** > Circuit Time of Day Schedule > **Add >** Circuit Time of Day Schedule

Default: 2400

Options: 0 to 2400

Function: Specifies the time of day the demand or backup circuit is no longer available. The router uses this parameter and the Start Time parameter to establish a time period when the circuit is available. This value also specifies the time of day that all secondary lines are deactivated if you set up bandwidth-on-demand service for a PPP demand circuit.

Instructions: Enter an hour of the day, using the 24-hour-system of expressing time. For example, to deactivate the circuit at 10:00 p.m., enter 2200.

For the router to deactivate the circuit at the configured end time, ensure that the Availability Mode parameter is set to the default, Available. If you do not want the router to deactivate the circuit at the end time, set the Availability Mode to Not Available.

MIB Object ID: 1.3.6.1.4.1.18.3.5.1.4.11.1.6

Parameter: **Inactivity Timeout**

Path: **Demand Circuits only:** Dialup > Demand Circuits **>** Demand Pools> **PPP** or **FR Circuits >** PPP or FR Demand Circuits **> Schedule >** Circuit Time of Day Schedule or Pool Availability List > **Add** > Circuit Time of Day Schedule

Default: Disable

Options: Enable │ Disable

Function: Determines whether the router uses the Inactivity Time parameter to control circuit activity during the configured start time and end time. The Inactivity Time parameter defines the number of seconds that can elapse without data going across the line before the router disconnects the call.

Instructions: Enter Enable if you want the router to use the Inactivity Time parameter, and the Start Time and End Time parameters to determine when the circuit is available. If there is no data going across the line, the Inactivity Time parameter instructs the router to disconnect the call.

Accept the default, Disable, if you want the router to establish the connection at the start time and remain active until the configured end time, regardless of data activity and regardless of the setting of the Availability Mode parameter. Only the network can bring down the connection.

MIB Object ID: 1.3.6.1.4.1.18.3.5.1.4.11.1.7

Parameter: **Availability Mode**

Path: **Demand Circuits:** Dialup > Demand Circuits **>** Demand Pools> **PPP** or **FR Circuits >** PPP or FR Demand Circuits **> Schedule >** Circuit Time of Day Schedule or Pool Availability List

Backup Circuits: Dialup > Backup Circuits > PPP or Frame Relay > Primary Circuit Definition or FR Primary Interface Definition> **Schedule** > Circuit Time of Day Schedule

Default: Available

Options: Available │ Not Available

Function: Determines whether the router activates the circuit between the configured time interval specified with the Days, Start Time and End Time parameters).

Instructions: Accept the default, Available, to allow the router to establish the circuit between the time interval you specified in the Days, Start Time and End Time parameters. Select Not Available to prevent the router from establishing the circuit during this time interval.

For demand circuits only, you must set the Inactivity Timeout parameter to Enable for this parameter to have any affect. The Inactivity Timeout parameter is not applicable for backup circuits.

MIB Object ID: 1.3.6.1.4.1.18.3.5.1.4.11.1.8

Parameter: **TimeOfDay Failback Mode**

Path: **Demand Circuits only:** Dialup > Demand Circuits **>** Demand Pools> **PPP** or **FR Circuits >** PPP or FR Demand Circuits **> Schedule >** Circuit Time of Day Schedule or Pool Availability List > **Add** > Circuit Time of Day Schedule

Default: Automatic

Options: Automatic │ Manual

Function: For PPP standby circuits only, this parameter controls the failback to the primary circuit if the Standby Failback Mode parameter is set to None.

Instructions: Select Automatic to automatically deactivate the hot standby circuit and return to the primary circuit. The Failback Time parameter for this circuit determines the failback delay. Select Manual to manually deactivate the hot standby circuit.

MIB Object ID: 1.3.6.1.4.1.18.3.5.1.4.11.1.9

Parameter:	**Failback Time (min.)**
Path:	**Demand Circuits only:** Dialup > Demand Circuits **>** Demand Pools> **PPP** or **FR Circuits >** PPP or FR Demand Circuits **> Schedule >** Circuit Time of Day Schedule or Pool Availability List > **Add** > Circuit Time of Day Schedule
Default:	0
Options:	0 to 1439 minutes
Function:	For PPP standby circuits only, this parameter indicates the amount of time the router waits before deactivating the standby circuit and returning to a recovered primary circuit. This option is available only if the Standby Mode parameter is set to Hot Standby, the Standby Failback Mode parameter is set to None, and you have selected a primary circuit for the Standby Primary Circuit parameter.
Instructions:	Enter the amount of time, in minutes, that the router should wait before returning to the primary circuit for data transmission. Be sure to consider how much time it takes to ensure that the primary circuit is stable.
MIB Object ID:	1.3.6.1.4.1.18.3.5.1.4.11.1.10

Demand Circuit Group Parameters

Parameter: Pool ID

Path: Dialup > Demand Circuit Groups > Demand Circuit Groups > **Add Group** > Enter a Demand Pool

Default: None

Options: 1 to 255

Function: Identifies the demand pool that you want the demand circuit group to use.

Instructions: Enter the ID number of an existing demand pool.

MIB Object ID: 1.3.6.1.4.1.18.3.5.1.4.5.1.6

Parameter: Number of Circuits

Path: Dialup > Demand Circuit Groups > Demand Circuit Groups > **Add Group** > Enter a Demand Pool

Default: None

Options: Maximum number of lines in the line pool

Function: Indicates how many unnumbered circuits are in the demand circuit group.

Instructions: Enter a number that is less than or equal to the number of lines in the demand pool associated with this circuit group.

MIB Object ID: 1.3.6.1.4.1.18.3.5.1.4.12.1.4

Caller Resolution Info Parameters for Demand Circuit Groups

Parameter: Caller Name

Path: Dialup > Demand Circuit Groups > Demand Circuit Groups > **Add Group** > Enter a Demand Pool > **OK** > Caller Resolution Info

Default: None

Options: Any text string; maximum 20 characters

Function: This name is part of the incoming call and informs the local router of the remote router's identity.

Instructions: Enter a text string no longer than 20 characters that identifies a remote router. If you configure CHAP as the authentication protocol, enter the remote router's CHAP name. If you configure PAP, enter the remote router's PAP ID.

MIB Object ID: 1.3.6.1.4.1.18.3.5.9.2.3.1.2

Parameter: CHAP Secret

Path: Dialup > Demand Circuit Groups > Demand Circuit Groups > **Add Group** > Enter a Demand Pool > **OK** > Caller Resolution Info

Default: Unsecured

Options: Any text string; maximum 20 characters

Function: Specifies the CHAP secret you assign to this interface. The CHAP secret is for identification and security purposes, and must be the same on both sides of the connection.

When one router places a call to another router, the authentication process takes place. During this phase, the routers exchange challenge packets that include the CHAP secret. Both routers on a link must have the same CHAP secret to correctly calculate responses to the challenges.

Instructions: If you configure CHAP as the authentication protocol, specify the CHAP secret. If not, ignore this parameter.

MIB Object ID: 1.3.6.1.4.1.18.3.5.9.2.3.1.4

Parameter: PAP Password

Path: Dialup > Demand Circuit Groups > Demand Circuit Groups > **Add Group** > Enter a Demand Pool > **OK** > Caller Resolution Info

Default: None

Options: Any text string; maximum 25 characters

Function: Specifies the PAP password you assign to this interface. The PAP password is for identification and security purposes, and must be the same on both sides of the connection.

During the authentication phase, all Password Authenticate-Request messages that the calling router sends to the called router must include the correct password. If the password is not correct, the called router sends an Authenticate-Negative Acknowledgment (Authenticate-NAK) message and the router does not activate the connection.

Instructions: If you configured PAP as the authentication protocol, specify a unique PAP password. If not, ignore this parameter.

MIB Object ID: 1.3.6.1.4.1.18.3.5.9.2.3.1.5

Demand Circuit Group Protocol Parameters

Parameter: IP Enable

Path: Dialup > Demand Circuit Groups > Demand Circuit Groups
Default: Disable
Options: Enable | Disable
Function: Enables or disables IP for this interface.
Instructions: Select Enable to enable IP for this interface.
MIB Object ID: 1.3.6.1.4.1.18.3.5.1.4.12.1.5

Parameter: Associated IP Address

Path: Dialup > Demand Circuit Groups > Demand Circuit Groups
Default: None
Options: Any valid IP address
Function: Specifies an address that IP uses when sending a packet. All circuits in the demand circuit group use this address, which specifies a numbered interface on the router. IP routing protocols use the numbered address to advertise the local router to remote routers. For more information about associated IP addresses, refer to *Configuring IP Services*.
Instructions: Enter the address of any numbered interface on the router. If you are running RIP over the unnumbered interface, and are using a subnet address as the associated address, the local and remote associated addresses should have the same network number.
MIB Object ID: 1.3.6.1.4.1.18.3.5.1.4.12.1.6

Parameter: RIP Enable

Path: Dialup > **Demand Circuit Groups** > Demand Circuit Groups
Default: Disable
Options: Enable │ Disable
Function: Enables or disables RIP for this interface.
Instructions: Select Enable to enable RIP for this interface.
MIB Object ID: 1.3.6.1.4.1.18.3.5.1.4.12.1.7

Parameter: OSPF Enable

Path: Dialup > **Demand Circuit Groups** > Demand Circuit Groups
Default: Disable
Options: Enable │ Disable
Function: Enables or disables OSPF for this interface.
Instructions: Select Enable to enable OSPF for this interface.
MIB Object ID: 1.3.6.1.4.1.18.3.5.1.4.12.1.8

Parameter: IPX Enable

Path: Dialup > **Demand Circuit Groups** > Demand Circuit Groups
Default: Disable
Options: Enable │ Disable
Function: Enables or disables IPX for this interface.
Instructions: Select Enable to enable IPX for this interface.
MIB Object ID: 1.3.6.1.4.1.18.3.5.1.4.12.1.9

Parameter: IPX Routing Protocol

Path: Dialup > **Demand Circuit Groups** > Demand Circuit Groups
Default: RIP/SAP
Options: RIP/SAP
Function: Specifies an IPX routing protocol for the IPX interface.
Instructions: Select an IPX routing protocol for this interface.
MIB Object ID: 1.3.6.1.4.1.18.3.5.1.4.12.1.12

Parameter: IPXWAN Enable

Path: Dialup > **Demand Circuit Groups** > Demand Circuit Groups
Default: Disable
Options: Enable │ Disable
Function: Enables or disables IPXWAN for this interface.
Instructions: Select Enable to enable IPXWAN for this interface.
MIB Object ID: 1.3.6.1.4.1.18.3.5.1.4.12.1.13

Parameter: Bridge Enable

Path: Dialup > **Demand Circuit Groups** > Demand Circuit Groups
Default: Disable
Options: Enable │ Disable
Function: Enables or disables bridging for this interface.
Instructions: Select Enable to enable bridging for this interface.
MIB Object ID: 1.3.6.1.4.1.18.3.5.1.4.12.1.10

PPP Circuit Options Parameters (Dial Backup)

Parameter: Circuit Type

Path: Dialup > Backup Circuits > PPP > Primary Circuit Definition > **Cct Type >** Circuit Options

Default: Normal

Options: Primary │ Normal

Function: Specifies whether the circuit over the selected leased line uses dial backup service. This line is not part of the backup pool. For a standard leased circuit, the router does not provide a backup if the original circuit fails. For a primary circuit, the router provides a backup to carry the data.

Instructions: Accept the default, Normal, if you do not want a backup circuit for the data. Select Primary if you want to use dial backup service.

MIB Object ID: 1.3.6.1.4.1.18.3.5.1.4.1.1.31

Parameter: Backup Pool ID

Path: Dialup > Backup Circuits > PPP > Primary Circuit Definition > **Cct Type >** Circuit Options

Default: None

Options: 1 to 255

Function: Identifies the backup pool for the primary circuit.

Instructions: If you select Primary for the Circuit Type parameter, enter the ID of the backup pool that this circuit should use. If you accept the default, Normal, for the Circuit Type parameter, do not enter a value for this parameter.

MIB Object ID: 1.3.6.1.4.1.18.3.5.1.4.5.1.5

PPP Primary Circuit Definition Parameters (Dial Backup)

Parameter: Backup Pool ID

Path: Dialup > Backup Circuits > PPP > Primary Circuit Definition
Default: None
Options: 1 to 255
Function: Identifies the backup pool for the primary circuit.
Instructions: Enter the ID number of the backup pool this circuit should use.
MIB Object ID: 1.3.6.1.4.1.18.3.5.1.4.5.1.5

Parameter: Backup Mode

Path: Dialup > Backup Circuits > PPP > Primary Circuit Definition
Default: Master
Options: Master | Slave
Function: Determines which router initiates dialing to establish a backup connection if the primary circuit fails.
Instructions: Accept the default, Master, if you want the router to initiate dialing. The router at the other end must be set to Slave so that it waits until the master router initiates the call. Only one router on the link can serve as the master router. If both are set to Master, they may try to initiate a call simultaneously, resulting in a collision on the network.

If you change the Backup Mode parameter from Master to Slave, Site Manager displays the Caller Resolution Info window, prompting you to make a caller resolution table entry for the circuit. By requiring a table entry, Site Manager ensures that you identify the remote master router.The local router can then verify the master router's identity and accept the incoming calls. Refer to the appropriate parameter descriptions for this window.

MIB Object ID: 1.3.6.1.4.1.18.3.5.1.4.5.1.7

Frame Relay Interface Type Parameter (Dial Backup)

Parameter: **Interface Type**

Path: Dialup > Backup Circuits > Frame Relay > FR Primary Interface Definition > **Intf. Type >** FR Interface Slot <*n*>,<*port*>

Default: Normal

Options: Normal │ Primary/Shared │ Primary/Secondary

Function: Specifies whether this leased circuit uses dial backup service. For a standard leased circuit, the router does not provide a backup circuit if it fails. For a primary circuit, the router provides a backup circuit.

Instructions: Select one of the following options:

Normal -- Indicates that there is no backup service for this circuit.

Primary/Shared -- Enables backup service and instructs the router that the backup circuit should inherit the primary circuit's configuration.

If you select this option, Site Manager displays a dialog box asking if you want the primary circuit's PVCs duplicated on the backup circuit.

- Select **Yes** to create a duplicate set of PVCs with the same DLCI numbers as the primary circuit. This is useful if you want the same DLCI numbers going to the same destination.
- Select **No** to configure unique PVCs for the backup circuit. This option is useful if you do not want to back up all of the primary's PVCs. By limiting the number of backup PVCs, you can reduce line costs.

Primary/Secondary -- Enables backup service and instructs the router that the backup circuit should use its own configuration. The backup circuit does not adopt the primary circuit's configuration.

MIB Object ID: 1.3.6.1.4.1.18.3.5.9.9.1.1.33

Parameter:	**Pool ID**
Path:	Dialup > Backup Circuits > Frame Relay > FR Primary Interface Definition > **Intf. Type >** FR Interface Slot <*n*>,<*port*>
Default:	None
Options:	1 to 255
Function:	Identifies the backup pool that the primary circuit uses.
Instructions:	If you selected primary/shared or primary/secondary as the interface type, enter an existing backup pool for the primary circuit. If you selected Normal as the interface type, do not enter a pool ID.
MIB Object ID:	1.3.6.1.4.1.18.3.5.1.4.5.1.5

Frame Relay Primary Interface Definition Parameters (Dial Backup)

Parameter: **Backup Pool ID**

Path: Dialup > Backup Circuits > Frame Relay > FR Primary Interface Definition
Default: None
Options: 1 to 255
Function: Identifies the backup pool for the primary circuit.
Instructions: Enter the ID number of the backup pool this circuit should use.
MIB Object ID: 1.3.6.1.4.1.18.3.5.1.4.5.1.5

Parameter: **Primary Down Time**

Path: Dialup > Backup Circuits > Frame Relay > FR Primary Interface Definition
and
Dialup > Demand Circuits > **PPP Circuits** > PPP Demand Circuits
Default: 5 minutes
Options: 1 to 999,999 minutes
Function: Specifies the amount of time the router waits after it boots, before activating a backup connection. This timer ensures that the primary connection is not operating before the router activates a backup connection.
Instructions: Enter the amount of time the router should wait before activating a backup connection.
MIB Object ID: 1.3.6.1.4.1.18.3.5.1.4.5.1.17

Parameter: **Use Backup Interface Filters**

Path: Dialup > Backup Circuits > Frame Relay > FR Primary Interface Definition
Default: Disabled
Options: Enabled | Disabled
Function: Enables the routers to filter unwanted data from going across the backup circuit. This parameter is configurable only if the interface type is primary/shared.
Instructions: Select Enable to use filters; otherwise, accept the default.
MIB Object ID: 1.3.6.1.4.1.18.3.5.9.9.1.1.34

Frame Relay Interface Parameters (Demand and Dial Backup)

Parameter:	**FR Service Control**
Path:	**Demand Circuits:** Dialup > Demand Circuits > **FR Circuits** > FR Demand Circuits > **Demand Intf.** > FR Demand Interface List **Backup Circuits:** Dialup > Backup Circuits > Frame Relay > FR Primary Interface Definition > **Backup Def.** > FR Backup Interface
Default:	Enable (for dial backup primary/shared interfaces) | Disable (for dial backup primary/secondary interfaces and dial-on-demand interfaces)
Options:	Enable | Disable
Function:	Enables the Frame Relay interface.
Instructions:	For dial backup primary/secondary interfaces and dial-on-demand interfaces, select Enable to activate the Frame Relay interface once the configuration is complete. Otherwise, accept the default. For dial backup primary/shared interfaces, select Disable to deactivate the Frame Relay interface. Otherwise, accept the default.
MIB Object ID:	1.3.6.1.4.1.18.3.5.9.9.1.1.2

Parameter: **Mgmnt Type**

Path: **Demand Circuits:** Dialup > Demand Circuits > **FR Circuits** > FR Demand Circuits > **Demand Intf.** > FR Demand Interface List

Backup Circuits: Dialup > Backup Circuits > Frame Relay > FR Primary Interface Definition > **Backup Def.** > FR Backup Interface

Default: ANSI T1.617D

Options: DLCMI None │ Rev 1 LMI │ ANSI T1.617D │ CCITT Annex A │ LMI Switch │ Annex D Switch │ Annex A Switch

Function: Specifies the management protocol that the router and the Frame Relay network use to exchange status information. Routers connected back to back also use a management protocol to exchange status information.

DLCMI None provides no management interface between the router and the Frame Relay network. In the absence of management support, you must configure all PVCs manually.

Rev 1 LMI provides user-side management services, as specified by Revision 1 of the Local Management Interface standard.

ANSI T1.617D provides user-side management services, as specified in Annex D to ANSI standard T1.617-1991.

CCITT Annex A provides user-side management services, as specified by the ITU-T (formerly CCITT).

LMI Switch offers limited management services for the DCE side of the connection, as specified by Revision 1 of the Local Management Interface standard.

Annex D Switch provides limited management services for the DCE side of the connection, as specified in Annex D to ANSI standard T1.617-1991.

Annex A Switch provides limited management services for the DCE side of the connection, as specified by the ITU-T.

Instructions: Select the management protocol for the Frame Relay network. The LMI Switch, Annex D Switch, and Annex A Switch options are primarily for troubleshooting.

MIB Object ID: 1.3.6.1.4.1.18.3.5.9.9.1.1.6

Parameter: **Address Type**

Path: **Demand Circuits:** Dialup > Demand Circuits > **FR Circuits** > FR Demand Circuits > **Demand Intf.** > FR Demand Interface List

Backup Circuits: Dialup > Backup Circuits > Frame Relay > FR Primary Interface Definition > **Backup Def.** > FR Backup Interface

Default: ADDR Q922

Options: ADDR Q922 | ADDR Q922 November 90 | ADDR Q922 MARCH 90 | ADDR Q921

Function: Specifies the DLCI addressing type.

ADDR Q922 selects addressing as specified in the final version of the Q.922 standard. Q.922 provides for FECN, BECN, DE, and EA bits. While most Q.922 addresses are included within a 2-octet field, the standard allows for 3- and 4-octet address fields.

The **November draft of ADDR Q922** differs from ADDR Q922 in dropping the D/C bit from the extended (3- and 4-byte) forms.

The **March draft of ADDR Q922** differs from ADDR Q922 in defining an 11-bit DLCI and dropping the DE bit from the second octet of the address field.

ADDR Q921 differs from ADDR Q922 MARCH 90 in that it does not use FECNs or BECNs.

Instructions: Select the addressing type for the Frame Relay interface.

MIB Object ID: 1.3.6.1.4.1.18.3.5.9.9.1.1.8

Parameter: **Address Length**

Path: **Demand Circuits:** Dialup > Demand Circuits > **FR Circuits** > FR Demand Circuits > **Demand Intf.** > FR Demand Interface List

Backup Circuits: Dialup > Backup Circuits > Frame Relay > FR Primary Interface Definition > **Backup Def.** > FR Backup Interface

Default: Two Byte

Options: Two Byte │ Three Byte │ Four Byte

Function: Specifies the length of the Frame Relay address field.

The length of this field determines the range of valid numbers for the DLCI number set in the Frame Relay PVC List window. Refer to *Configuring Frame Relay Services* for more information.

Instructions: Select the address length for the address field. This must match what the network specifies.

MIB Object ID: 1.3.6.1.4.1.18.3.5.9.9.1.1.9

Parameter: **Polling Interval**

Path: **Demand Circuits:** Dialup > Demand Circuits > **FR Circuits** > FR Demand Circuits > **Demand Intf.** > FR Demand Interface List

Backup Circuits: Dialup > Backup Circuits > Frame Relay > FR Primary Interface Definition > **Backup Def.** > FR Backup Interface

Default: 10 seconds

Options: 5 to 30 seconds

Function: Specifies the interval between status inquiry messages that the router transmits. Status inquiry messages cause a network response in the form of a link Integrity verification message or full status message. Successful completion of the request/response “handshake” verifies the status of the router/Frame Relay network link.

Instructions: We recommend that you accept the default value, 10 seconds. If the default value does not match what the network requests, enter a value that is appropriate for your network in the range of 5 to 30 seconds. Polling Interval does not function if you set Mgmnt Type to DLCMI None.

MIB Object ID: 1.3.6.1.4.1.18.3.5.9.9.1.1.10

Parameter: **Full Enquiry Interval**

Path: **Demand Circuits:** Dialup > Demand Circuits > **FR Circuits** > FR Demand Circuits > **Demand Intf.** > FR Demand Interface List

Backup Circuits: Dialup > Backup Circuits > Frame Relay > FR Primary Interface Definition > **Backup Def.** > FR Backup Interface

Default: 6

Options: 1 to 255 polling intervals

Function: Specifies the interval between full status inquiry messages that the router transmits. Full status inquiry messages cause the network to send a full status report message, which lists all PVCs, the PVC status (active or inactive), and whether the PVC is new or previously established. This parameter works with the Polling Interval parameter.

The default value, 6, tells the router to send a full status inquiry every 6 polling intervals. For example, with a polling interval of 10 and a full enquiry interval of 6, the router transmits a full status inquiry every 60 seconds; with a polling interval of 20 and a full enquiry interval of 30, the router transmits a full status inquiry every 10 minutes (600 seconds).

Instructions: Enter a value from 1 to 255, according to what the network dictates. Full Enquiry Interval does not function if you set Mgmnt Type to DLCMI None.

MIB Object ID: 1.3.6.1.4.1.18.3.5.9.9.1.1.11

Parameter: **Error Threshold**

Path: **Demand Circuits:** Dialup > Demand Circuits > **FR Circuits** > FR Demand Circuits > **Demand Intf.** > FR Demand Interface List

Backup Circuits: Dialup > Backup Circuits > Frame Relay > FR Primary Interface Definition > **Backup Def.** > FR Backup Interface

Default: 3

Options: 0 to 2,147,483,647

Function: Together with the value of the Monitored Events parameter, establishes a criterion to evaluate the quality of the router/Frame Relay network connection.

If you accept the default values for both Error Threshold and Monitored Events, three status exchange errors in a sequence of four attempted exchanges will bring the connection down. With Error Threshold set to 5 and Monitored Events set to 10, five status exchange errors in a continuous sequence of ten attempted exchanges will bring the connection down.

After the network clears the connection, status exchanges continue, and the router monitors line integrity. When the number of consecutive, successful status exchanges is equal to the Error Threshold value, the router restores the Frame Relay connection.

Error Threshold and Monitored Events are nonfunctional if you set Mgmnt Type to DLCMI None.

Instructions: Enter the number of faulty status exchanges that will bring the connection down.

MIB Object ID: 1.3.6.1.4.1.18.3.5.9.9.1.1.1

Parameter: **Monitored Events**

Path: **Demand Circuits:** Dialup > Demand Circuits > **FR Circuits** > FR Demand Circuits > **Demand Intf.** > FR Demand Interface List

Backup Circuits: Dialup > Backup Circuits > Frame Relay > FR Primary Interface Definition > **Backup Def.** > FR Backup Interface

Default: 4

Options: 0 to 2,147,483,647

Function: Together with the value of the Error Threshold parameter, establishes a criterion to evaluate the quality of the router/Frame Relay network connection. Refer to the description of the Error Threshold parameter for more information.

Instructions: Enter the number of consecutive status exchanges you want the router to monitor.

MIB Object ID: 1.3.6.1.4.1.18.3.5.9.9.1.1.13

Parameter: **Multicast**

Path: **Demand Circuits:** Dialup > Demand Circuits > **FR Circuits** > FR Demand Circuits > **Demand Intf.** > FR Demand Interface List

Backup Circuits: Dialup > Backup Circuits > Frame Relay > FR Primary Interface Definition > **Backup Def.** > FR Backup Interface

Default: Disable

Options: Enable | Disable

Function: Enables or disables support for Frame Relay multicast service.

Instructions: Set to Enable if your Frame Relay subscription service provides multicast service, and if this Frame Relay interface should receive multicast messages.

MIB Object ID: 1.3.6.1.4.1.18.3.5.9.9.1.1.16

Parameter: **Congestion Control**

Path: **Demand Circuits:** Dialup > Demand Circuits > **FR Circuits** > FR Demand Circuits > **Demand Intf.** > FR Demand Interface List

Backup Circuits: Dialup > Backup Circuits > Frame Relay > FR Primary Interface Definition > **Backup Def.** > FR Backup Interface

Default: Disable

Options: Enable | Disable

Function: Enables or disables congestion control on this interface.

Instructions: Set to Enable to activate congestion control. This value tells the router to drop all outbound traffic destined for a PVC where congestion is occurring until the congestion clears. The value of this parameter affects all PVCs that you do not individually configure.

MIB Object ID: 1.3.6.1.4.1.18.3.5.9.9.1.1.22

Parameter: **Congestion Timer**

Path: **Demand Circuits:** Dialup > Demand Circuits > **FR Circuits** > FR Demand Circuits > **Demand Intf.** > FR Demand Interface List

Backup Circuits: Dialup > Backup Circuits > Frame Relay > FR Primary Interface Definition > **Backup Def.** > FR Backup Interface

Default: 1 second

Options: 0.5 to 5 seconds, in 0.5-second intervals

Function: Specifies the length of time during which the router counts congestion notifications. If the router receives the number of congestion notifications set by the congestion counter parameter, the router stops transmitting data. The router resumes transmission once it stops receiving congestion notifications.

Instructions: Set the length of time the router should count congestion notifications from the network. If you set this parameter for a long time period, the router may be less likely to stop transmission for an intermittent congestion condition. However, the router may be slow to detect congestion, resulting in long transmission delays once the congestion has cleared. The value of this parameter applies to all PVCs that you do not individually configure.

MIB Object ID: 1.3.6.1.4.1.18.3.5.9.9.1.1.23

Parameter: **Congestion Counter**

Path: **Demand Circuits:** Dialup > Demand Circuits > **FR Circuits** > FR Demand Circuits > **Demand Intf.** > FR Demand Interface List

Backup Circuits: Dialup > Backup Circuits > Frame Relay > FR Primary Interface Definition > **Backup Def.** > FR Backup Interface

Default: 20 notifications

Options: 1 to 500 notifications

Function: Indicates the maximum number of congestion notifications that the router can receive during the congestion timer period before it stops transmitting. If the router reaches the value set by this parameter, it determines the line is congested and stops transmitting.

Instructions: Specify the congestion count. The smaller the number, the more quickly the router detects congestion and stops transmitting. The value of this parameter applies to all PVCs that you do not individually configure.

MIB Object ID: 1.3.6.1.4.1.18.3.5.9.9.1.1.24

Parameter: **Hangup on DLCMI Failure**

Path: **Demand Circuits:** Dialup > Demand Circuits > **FR Circuits** > FR Demand Circuits > **Demand Intf.** > FR Demand Interface List

Backup Circuits: Dialup > Backup Circuits > Frame Relay > FR Primary Interface Definition > **Backup Def.** > FR Backup Interface

Default: Disable

Options: Enable │ Disable

Function: Indicates whether to terminate the backup connection if the Frame Relay switch does not initially respond to the call with a full status message.

Instructions: Select Enable if you want the router to clear the backup circuit when the switch does not respond. Otherwise, accept the default.

MIB Object ID: 1.3.6.1.4.1.18.3.5.9.9.1.1.32

Service List Parameter (Demand and Dial Backup)

Parameter:	**Service Name**
Path:	**Demand Circuits:** Dialup > Demand Circuits > **FR Circuits** > FR Demand Circuits > **Demand Intf.** > FR Demand Interface List > **Services** > Frame Relay Demand Service List **Backup Circuits:** Dialup > Backup Circuits > Frame Relay > FR Primary Interface Definition > **Backup Def.** > FR Backup Interface > **Services >** Frame Relay Backup Service List
Default:	Circuit name that Site Manager assigns
Options:	Variable-length text string
Function:	Identifies the service record.
Instructions:	Each service record must have a unique name, which the router assigns. Change it only if you are certain that the new name you assign is unique.
MIB Object ID:	1.3.6.1.4.1.18.3.5.9.9.5.1.7

Frame Relay PVC Parameters (Demand and Dial Backup)

You cannot enter values for the following Frame Relay PVC parameters: Node Protection Key, Encrypt Enable, LTSS Name, LTSS Value, and MEK Change. These parameters are available only if you enable data encryption. For information about encryption, refer to *Configuring Data Encryption Services*.

Parameter: DLCI Number

Path: Dialup > Backup Circuits > Frame Relay > FR Primary Interface Definition > **Backup Def.** > FR Backup Interface > **Services >** Frame Relay Backup Service List > **PVCs > Add >** Frame Relay PVC Add

Default: None

Options: The Frame Relay switch provider assigns DLCI numbers. These assigned numbers are valid options.

Valid DLCI numbers vary based on the Frame Relay address length. The DLCI numbers that the switch provider assigns are generally in the following ranges:

2 byte -- 16 to 1007
3 byte -- 1024 to 6451
4 byte -- 131,072 to 8,257,535

Function: Specifies the PVC identification number that the Frame Relay network uses to direct data. If you are running IP over Frame Relay, the router uses this number as the MAC address for an adjacent host. Refer to *Configuring IP Services* for more information about adjacent hosts.

Instructions: Enter the decimal number that the Frame Relay provider assigns.

MIB Object ID: 1.3.6.1.4.1.18.3.5.9.9.2.1.4

Parameter: Circuit State Set

Path: **Demand Circuits:** Dialup > Demand Circuits > **FR Circuits** > FR Demand Circuits > **Demand Intf.** > FR Demand Interface List > **Services** > Frame Relay Demand Service List > **PVCs > Add >** FR PVC List for Demand Service *<service no.>*

Backup Circuits: Dialup > Backup Circuits > Frame Relay > FR Primary Interface Definition > **Backup Def.** > FR Backup Interface > **Services >** Frame Relay Backup Service List > **PVCs > Add >** Frame Relay Backup PVC List

Default: Active

Options: Invalid │ Active │ Inactive

Function: Specifies the state of the PVC.

Instructions: Set to Active to indicate to a Frame Relay switch that the PVC is available for use. Set to Inactive to indicate that the PVC is configured, but not available for use, for example, before your switch provider actually activates the PVC. Choose Invalid if the PVC is configured, but the switch is unaware of it.

MIB Object ID: 1.3.6.1.4.1.18.3.5.9.9.2.1.7

Parameter: Multicast

Path: **Demand Circuits:** Dialup > Demand Circuits > **FR Circuits** > FR Demand Circuits > **Demand Intf.** > FR Demand Interface List > **Services** > Frame Relay Demand Service List > **PVCs > Add >** FR PVC List for Demand Service *<service no.>*

Backup Circuits: Dialup > Backup Circuits > Frame Relay > FR Primary Interface Definition > **Backup Def.** > FR Backup Interface > **Services >** Frame Relay Backup Service List > **PVCs > Add >** Frame Relay Backup PVC List

Default: Unicast

Options: Unicast │ Multicast

Function: Indicates whether this PVC is multicast or unicast.

Instructions: Set to unicast or multicast according to PVC type, as the Frame Relay switch provider instructs.

MIB Object ID: 1.3.6.1.4.1.18.3.5.9.9.2.1.19

Parameter: **Hybrid Mode**

Path: **Demand Circuits:** Dialup > Demand Circuits > **FR Circuits** > FR Demand Circuits > **Demand Intf.** > FR Demand Interface List > **Services** > Frame Relay Demand Service List > **PVCs > Add >** FR PVC List for Demand Service *<service no.>*

Backup Circuits: Dialup > Backup Circuits > Frame Relay > FR Primary Interface Definition > **Backup Def.** > FR Backup Interface > **Services >** Frame Relay Backup Service List > **PVCs > Add >** Frame Relay Backup PVC List

Default: OFF

Options: ON │ OFF

Function: Allows you to use the same PVC for both routing and bridging.

Instructions: Set to ON if you want to enable both routing and bridging services. If not, accept the default.

MIB Object ID: 1.3.6.1.4.1.18.3.5.9.9.2.1.24

Parameter: **Congestion Control**

Path: **Demand Circuits:** Dialup > Demand Circuits > **FR Circuits** > FR Demand Circuits > **Demand Intf.** > FR Demand Interface List > **Services** > Frame Relay Demand Service List > **PVCs > Add >** FR PVC List for Demand Service *<service no.>*

Backup Circuits: Dialup > Backup Circuits > Frame Relay > FR Primary Interface Definition > **Backup Def.** > FR Backup Interface > **Services >** Frame Relay Backup Service List > **PVCs > Add >** Frame Relay Backup PVC List

Default: Inherit

Options: Disable │ Enable │ Inherit

Function: Enables or disables congestion control on this interface.

Instructions: Set to Enable to activate congestion control. This value tells the router to drop all traffic destined for a congested PVC until the congestion clears. Select Disable to deactivate congestion control. Accept the default, Inherit, if you want the Congestion Control setting for this PVC to match the setting you specify for the Frame Relay Interface Congestion Control parameter.

MIB Object ID: 1.3.6.1.4.1.18.3.5.9.9.2.1.25

Parameter: **Congestion Timer**

Path: **Demand Circuits:** Dialup > Demand Circuits > **FR Circuits** > FR Demand Circuits > **Demand Intf.** > FR Demand Interface List > **Services** > Frame Relay Demand Service List > **PVCs > Add >** FR PVC List for Demand Service *<service no.>*

Backup Circuits: Dialup > Backup Circuits > Frame Relay > FR Primary Interface Definition > **Backup Def.** > FR Backup Interface > **Services >** Frame Relay Backup Service List > **PVCs > Add >** Frame Relay Backup PVC List

Default: 1 second

Options: 0.5 to 5 seconds, in 0.5-second intervals

Function: Specifies the length of time during which the router counts congestion notifications. If the router receives the number of congestion notifications set by the Congestion Counter parameter, the router stops transmitting data. The router resumes transmission once it stops receiving congestion notifications.

Instructions: Set the length of time the router should count congestion notifications from the network. If you set this parameter for a long time period, the router may be less likely to stop transmission for an intermittent congestion condition. However, the router may be slow to detect congestion, resulting in long transmission delays once the congestion has cleared.

If you set the Congestion Control parameter to Inherit, the PVC uses DLCMI for congestion control, not the value of this parameter.

MIB Object ID: 1.3.6.1.4.1.18.3.5.9.9.2.1.27

Parameter: **Congestion Counter**

Path: **Demand Circuits:** Dialup > Demand Circuits > **FR Circuits** > FR Demand Circuits > **Demand Intf.** > FR Demand Interface List > **Services** > Frame Relay Demand Service List > **PVCs > Add >** FR PVC List for Demand Service *<service no.>*

Backup Circuits: Dialup > Backup Circuits > Frame Relay > FR Primary Interface Definition > **Backup Def.** > FR Backup Interface > **Services >** Frame Relay Backup Service List > **PVCs > Add >** Frame Relay Backup PVC List

Default: 20 notifications

Options: 1 to 500 notifications

Function: Sets the maximum number of congestion notifications that the router can receive during the Congestion Timer period before it stops transmitting.

Instructions: Specify the congestion count. The smaller the number, the more quickly the router detects congestion and stops transmitting. Note, however, that if you set the Congestion Control parameter to Inherit, the PVC uses DLCMI for congestion control, not the value of this parameter.

MIB Object ID: 1.3.6.1.4.1.18.3.5.9.9.2.1.28

Parameter: **Compression Control**

Path: **Demand Circuits:** Dialup > Demand Circuits > **FR Circuits** > FR Demand Circuits > **Demand Intf.** > FR Demand Interface List > **Services** > Frame Relay Demand Service List > **PVCs > Add >** FR PVC List for Demand Service *<service no.>*

Backup Circuits: Dialup > Backup Circuits > Frame Relay > FR Primary Interface Definition > **Backup Def.** > FR Backup Interface > **Services >** Frame Relay Backup Service List > **PVCs > Add >** Frame Relay Backup PVC List

Default: Enable

Options: Enable | Disable

Function: Enables or disables data compression for this service record.

Instructions: Accept the default, Enable, or select Disable if you decide not to use data compression for this service record.

MIB Object ID: 1.3.6.1.4.1.18.3.5.9.9.2.1.29

Bandwidth-on-Demand Circuit Options Parameters

Parameter: **Circuit Type**

Path: Dialup > Bandwidth On Demand Circuits > Bandwidth On Demand Circuit Definition > **Cct Type** > Circuit Options

Default: Normal

Options: Normal | Bandwidth-on-Demand

Function: Specifies whether the leased circuit uses bandwidth-on-demand service. For a normal synchronous circuit, the router does not provide bandwidth-on-demand service. For a bandwidth circuit, the router provides up to 29 additional lines to carry traffic when the bandwidth circuit is congested.

Instructions: Accept the default, Normal, if you do not want secondary circuits available for leased circuits. Select Bandwidth-on-Demand to provide bandwidth-on-demand service for a congested single circuit or multilink circuit.

Site Manager lists the circuit type next to the circuit name. If you select Non-Monitor for the Bandwidth Mode parameter, Site Manager will not allow you to enter values for the CHAP Local Name, CHAP Secret, PAP Local ID, and PAP Password parameters. These parameters are part of configuring the router as congestion monitor.

MIB Object ID: 1.3.6.1.4.1.18.3.5.1.4.5.1.3

Parameter: **Bandwidth-On-Demand Pool ID**

Path: Dialup > Bandwidth On Demand Circuits > Bandwidth On Demand Circuit Definition > **Cct Type** > Circuit Options

Default: None

Options: 1 to 255

Function: Identifies the bandwidth pool associated with the bandwidth circuit.

Instructions: If you select Bandwidth-on-Demand for the Circuit Type parameter, enter the ID of the bandwidth pool that this circuit should use. If you select Normal for the Circuit Type parameter, Site Manager does not allow you to enter a pool ID.

You must create a pool before you can specify a circuit as a bandwidth circuit. The router first creates the circuit as a normal circuit. See Chapter 9 for instructions on creating line pools.

MIB Object ID: 1.3.6.1.4.1.18.3.5.1.4.5.1.35

Parameter: Bandwidth Mode

Path: Dialup > Bandwidth On Demand Circuits > Bandwidth On Demand Circuit Definition > **Cct Type** > Circuit Options

Default: Non-Monitor (for leased circuits) | Dynamic Monitor (for demand circuits)

Options: Non-Monitor | Monitor | Dynamic Monitor (demand circuits only)

Function: Determines whether the router serves as the monitor router. The level of congestion determines when the router provides an additional circuit to carry data across the network.

Instructions: Select one of the following options:

Monitor -- Instructs the router to watch the congestion on the line or bundle. Only one router on the link can serve as the monitor router and activate a secondary line. The other router must be set to Non-Monitor. If both are set to Monitor, they may try to activate a secondary line simultaneously, resulting in a collision on the network.

If you configure bandwidth-on-demand service to aid a demand circuit, and this parameter is set to Monitor, ensure that the demand circuit's Connection Mode parameter is set to Collision Master or Collision Slave.

Non-Monitor -- Instructs the non-monitor router to wait for the monitor router to activate secondary lines. This router is not responsible for monitoring the congestion and it cannot initiate a connection.

Dynamic Monitor -- Select this option for configurations that use BAP to allocate bandwidth. It enables the router to function as the monitor or non-monitor router based on the direction of the call. With this value set, the router who initiates the call is the monitor, and the router who receives the call is the non-monitor.

If your router is communicating with a remote Bay Networks router, the remote router must be set to Dynamic Monitor, unless it uses software prior to Version 11.01, in which case, do not select this option.

If your router is communicating with a non-Bay Networks router, select this option.

MIB Object ID: 1.3.6.1.4.1.18.3.5.1.4.5.1.36

Bandwidth-on-Demand Circuit Definition Parameters

Parameter: **BOD Pool ID**

Path: Dialup > Bandwidth On Demand Circuits > Bandwidth On Demand Circuit Definition

Default: None

Options: 1 to 255

Function: Identifies the bandwidth pool associated with the bandwidth circuit.

Instructions: If you select Bandwidth-on-Demand for the Circuit Type parameter, enter the ID of the bandwidth pool that this circuit should use. If you select Normal for the Circuit Type parameter, Site Manager does not allow you to enter a pool ID.

You must create a pool before you can specify a circuit as a bandwidth circuit. The router first creates the circuit as a normal circuit.

MIB Object ID: 1.3.6.1.4.1.18.3.5.1.4.5.1.35

Parameter: **Bandwidth Mode**

Path: Dialup > Bandwidth On Demand Circuits > Bandwidth On Demand Circuit Definition > **Cct Type** > Circuit Options

Default: Non-Monitor (for leased circuits) | Dynamic Monitor (for demand circuits)

Options: Non-Monitor | Monitor | Dynamic Monitor (demand circuits only)

Function: Determines whether or not the router serves as the congestion monitor. The level of congestion determines when the router provides an additional circuit to carry data across the network.

Instructions: Refer to page A-78 for a description of this parameter.

MIB Object ID: 1.3.6.1.4.1.18.3.5.1.4.5.1.36

Bandwidth-on-Demand Congestion Monitor Parameters

Parameter: **Bandwidth-on-Demand Pool ID**

Path: Dialup > Bandwidth On Demand Circuits > Bandwidth On Demand Circuit Definition > **Options** > Bandwidth On Demand Monitor Options

Default: None

Options: 1 to 255

Function: Identifies an existing bandwidth pool.

Instructions: Enter the ID number of the bandwidth pool you want the circuit to use.

MIB Object ID: 1.3.6.1.4.1.18.3.5.1.4.5.1.35

Parameter: **PPP Circuit Mode**

Path: Dialup > Bandwidth On Demand Circuits > Bandwidth On Demand Circuit Definition > **Options** > Bandwidth On Demand Monitor Options

Default: Multilink

Options: Multilink | Multilink Monitor | Dynamic Monitor

Function: Specifies the type of multilink connection for this interface and the value of the PPP interface parameter PPP Mode.

Instructions: Select one of the following:

Multilink -- Site Manager supplies this value if the Bandwidth Mode parameter is Non-Monitor. It enables PPP multilink for this circuit. Selecting this value also prevents you from configuring the other monitor parameters.

Multilink Monitor -- Site Manager supplies this value if the Bandwidth Mode is Monitor. It enables PPP multilink and tells the router to monitor congestion.

If you configure bandwidth-on-demand service to aid a demand circuit, and this parameter is set to Monitor, ensure that the demand circuit's Connection Mode parameter is set to Collision Master or Collision Slave.

Dynamic Monitor -- Select this option for BAP connections to allocate bandwidth. This option lets the router function as the monitor or non-monitor router based on the direction of the call. The router who initiates the call is the monitor, and the router who receives the call is the non-monitor. If your router is communicating with a non-Bay Networks router, select this option. If your router is communicating with a Bay Networks router that uses software prior to Version 11.01, do not select this option.

MIB Object ID: 1.3.6.1.4.1.18.3.5.9.2.2.1.50

Parameter: BOD Exam Period

Path: Dialup > Bandwidth On Demand Circuits > Bandwidth On Demand Circuit Definition > **Options** > Bandwidth On Demand Monitor Options

Default: 10 (0.10-second intervals)

Options: 5 to 200 (in 0.10-second intervals)

Function: Indicates how often the router checks the bandwidth circuit to determine if the line or bundle is congested.

Instructions: Enter a value specifying how often you want the router to check the congestion on the bandwidth circuit. For example, entering a value of 200 means that the router checks the line every 20 seconds (200 x 0.10 seconds = 20 seconds).

MIB Object ID: 1.3.6.1.4.1.18.3.5.9.2.2.1.52

Parameter: BOD Full Threshold

Path: Dialup > Bandwidth On Demand Circuits > Bandwidth On Demand Circuit Definition > **Options** > Bandwidth On Demand Monitor Options

Default: 70 percent

Options: 10 to 400 percent

Function: Specifies a percentage of the maximum amount of data that the router transmits and receives. The data traffic must reach or exceed this percentage before the router considers the line or bundle congested.

Instructions: Enter a percentage that the router uses to measure congestion. If you configured data compression on the circuit, you may want to configure a threshold greater than 100 percent.

MIB Object ID: 1.3.6.1.4.1.18.3.5.9.2.2.1.53

Parameter: **BOD Periods to Fail**

Path: Dialup > Bandwidth On Demand Circuits > Bandwidth On Demand Circuit Definition > **Options** > Bandwidth On Demand Monitor Options

Default: 10

Options: 1 to 100

Function: Specifies the number of consecutive times the router finds that data traffic on the bandwidth circuit exceeds the configured congestion threshold, thereby concluding that the line or bundle is congested.

Instructions: Enter the number of consecutive times the circuit can exceed the threshold before the router activates a secondary line.

MIB Object ID: 1.3.6.1.4.1.18.3.5.9.2.2.1.54

Parameter: **Preferred Bandwidth Slot**

Path: Dialup > Bandwidth On Demand Circuits > Bandwidth On Demand Circuit Definition > **Options** > Bandwidth On Demand Monitor Options

Default: None

Options: Available slots in the bandwidth pool. For example, if the bandwidth pool has lines from slot 3 and slot 4, you cannot enter a value of 5.

Function: Specifies the slot the router chooses first when adding a line to a multilink bundle. For BAP configurations, the non-monitor router uses this parameter to determine which lines are available. It then sends the local phone number associated with an available line to the monitor router, which then dials the number to activate the line for additional bandwidth.

Instructions: Enter the number of the slot you want the router to use first, but note the following:

- Site Manager looks for another circuit configured as Monitor in the same pool as the newly created circuit. If one exists, Site Manager copies the value for the existing circuit's Preferred Bandwidth Slot parameter and enters it for this parameter. You do not have to enter a value.
- If this is the first circuit configured as Monitor in a pool that uses only one slot, Site Manager automatically enters the slot number. You do not have to enter a value.

MIB Object ID: 1.3.6.1.4.1.18.3.5.9.2.2.1.55

Parameter: Reserved Bandwidth Slot

Path: Dialup > Bandwidth On Demand Circuits > Bandwidth On Demand Circuit Definition > **Options** > Bandwidth On Demand Monitor Options

Default: None

Options: Available slots in the bandwidth pool. For example, if the bandwidth pool has lines from slot 3 and slot 4, you cannot enter a value of 5.

Function: Specifies the slot the router chooses when adding a line to a multilink bundle if the preferred slot cannot provide a line. For BAP configurations, the non-monitor router uses this parameter to determine which lines are available. It then sends the local phone number associated with an available line to the monitor router, which then dials the number to activate the line for additional bandwidth.

Instructions: Enter the number of the slot you want the router to use after checking the preferred slot, but note the following:

- Site Manager looks for another circuit configured as Monitor in the same pool as the newly created circuit. If one exists, Site Manager copies the value for the existing circuit's Reserved Bandwidth Slot parameter and enters it for this parameter. You do not have to enter a value.
- If this is the first circuit configured as Monitor in a pool that uses only one slot, Site Manager automatically enters the slot number. You do not have to enter a value.

MIB Object ID: 1.3.6.1.4.1.18.3.5.9.2.2.1.56

Parameter: Maximum Links

Path: Dialup > Bandwidth On Demand Circuits > Bandwidth On Demand Circuit Definition > **Options** > Bandwidth On Demand Monitor Options

Default: 4

Options: 1 to 30

Function: Specifies the maximum number of links (both leased and dial-up lines) allowed in the multilink bundle for this circuit at any one time.

Instructions: Enter the maximum number of links that you want in the bundle.

MIB Object ID: 1.3.6.1.4.1.18.3.5.9.2.2.1.58

Parameter: BOD Recovery Threshold

Path: Dialup > Bandwidth On Demand Circuits > Bandwidth On Demand Circuit Definition > **Options** > Bandwidth On Demand Monitor Options

Default: 50 percent

Options: 10 to 400 percent

Function: Specifies a percentage of the maximum amount of data that the router transmits and receives. The actual flow of data traffic must fall below this percentage before the router returns to the leased line or bundle exclusively.

Instructions: Enter a percentage that the router should reach before it returns to the leased line or bundle.

MIB Object ID: 1.3.6.1.4.1.18.3.5.9.2.2.1.59

Parameter: BOD Periods to Recover

Path: Dialup > Bandwidth On Demand Circuits > Bandwidth On Demand Circuit Definition > **Options** > Bandwidth On Demand Monitor Options

Default: 10

Options: 1 to 100

Function: Specifies the number of consecutive times the router checks the bandwidth circuit and determines that data traffic is below the configured congestion threshold. Once the router concludes that the circuit is no longer congested, it returns to the leased line or bundle exclusively.

Instructions: Enter the number of times the router should check if there is no longer a congestion condition before bringing down the secondary line.

MIB Object ID: 1.3.6.1.4.1.18.3.5.9.2.2.1.60

Parameter: **Multilink Fragmentation**

Path: Dialup > Bandwidth On Demand Circuits > Bandwidth On Demand Circuit Definition > **Options** > Bandwidth On Demand Monitor Options

Default: Permitted

Options: Permitted | Prohibited

Function: Enables the router to split up the data packet into smaller segments for more efficient transfer across the multilink circuit.

Instructions: Accept the default, Permitted, to enable fragmentation; otherwise, select Prohibited.

MIB Object ID: 1.3.6.1.4.1.18.3.5.9.2.2.1.51

Parameter: **Fragmentation Trigger Size**

Path: Dialup > Bandwidth On Demand Circuits > Bandwidth On Demand Circuit Definition > **Options** > Bandwidth On Demand Monitor Options

Default: 256

Options: 64 to 4000

Function: Specifies the minimum packet size that the router will fragment into smaller packets.

Instructions: Enter the packet size that will cause the router to fragment the packet.

MIB Object ID: 1.3.6.1.4.1.18.3.5.9.2.2.1.57

Bandwidth Allocation Protocol (BAP) Parameters

Parameter: **Enable**

Path: Circuits > Edit Circuits > Circuit List > **select circuit** > **Edit >** Circuit Definition > Protocols > Add/Delete > **BAP** > **OK** > Protocols > Edit BAP > Edit BAP Circuit Interface

Default: Disable

Options: Enable | Disable

Function: Enables or disables BAP service to manage the allocation of bandwidth across a multilink bundle. BAP is available only for ISDN lines.

Instructions: To enable BAP, choose Enable; otherwise, accept the default, Disable.

MIB Object ID: 1.3.6.1.4.1.18.3.5.9.2.2.1.65

Parameter: **No Phone Number Needed**

Path: Circuits > Edit Circuits > Circuit List > **select circuit** > **Edit >** Circuit Definition > Protocols > Add/Delete > **BAP** > **OK** > Protocols > Edit BAP > Edit BAP Circuit Interface

Default: Enable

Options: Enable | Disable

Function: Instructs the non-monitor router whether to send its local phone number to the monitor router during BAP negotiations for more bandwidth.

Instructions: Accept the default, Enable, if all the numbers that the monitor router requires are in the outgoing phone list. This value tells the non-monitor router not to supply phone numbers.

Select Disable if you configured only one outgoing phone number for the monitor router and you want the non-monitor router to supply phone numbers for dial-up connections. This option minimizes the task of configuring the outgoing phone list. Select Disable only for configurations where the default values of the ISDN Numbering Plan and ISDN Numbering Type parameters, located in the outgoing phone list, are acceptable to the ISDN switch

NOTE: Certain countries have ISDN networks where the default values of the ISDN Numbering Plan and ISDN Numbering Type parameters do not work. Ask your sales engineer for details.

MIB Object ID: 1.3.6.1.4.1.18.3.5.9.2.2.1.68

Local Phone Number Parameters

Parameter: Directory Number

Path: Dialup > Local Phone Numbers > ISDN Local Phone Lines > **Local Phones** > ISDN Local Phone Numbers > **Add** > Phone Number

Default: None

Options: A maximum of 20 numeric characters

Function: Specifies the phone number of the router. The value of this parameter must match the phone number that your service provider assigns to you when you receive ISDN service.

Any remote party that calls the router must include this phone number in the Called Party IE field of the call setup message. The Called Party IE must match the directory number exactly or the router will not answer the call.

Instructions: Enter the phone number your ISDN provider supplied when you received ISDN service. For switches in the United States, do not include the area code when you enter the phone number.

MIB Object ID: 1.3.6.1.4.1.18.3.5.9.8.12.1.4

Parameter: Ext/SubAddr

Path: Dialup > Local Phone Numbers > ISDN Local Phone Lines > **Local Phones** > ISDN Local Phone Numbers > **Add** > Phone Number

Default: None

Options: A maximum of 25 numeric characters

Function: Specifies a subaddress or an extension line for a main phone number that further identifies the local router. The subaddress is useful when you have several routers at a destination site, but the ISDN provider assigns only one phone number to the destination site. An incoming call has to specify the number and the subaddress to reach a specific router.

Instructions: Enter the extension/subaddress. You may assign this number or your ISDN provider may assign it when you receive ISDN service. Do not enter space, special, or alphabetic characters in the telephone number.

MIB Object ID: 1.3.6.1.4.1.18.3.5.9.8.12.1.5

Parameter: SPID

Path: Dialup > Local Phone Numbers > ISDN Local Phone Lines > **Local Phones** > ISDN Local Phone Numbers > **Add** > Phone Number

Default: None

Options: A maximum of 20 numeric characters

Function: For switches in the United States and Canada, the Service Profile Identifier (SPID) identifies an ISDN device to the switch so it knows which services to provide.

Instructions: Enter the SPID that your ISDN provider supplied when you received ISDN service. Ignore this parameter if you have a 5ESS switch on a point-to-point line.

MIB Object ID: 1.3.6.1.4.1.18.3.5.9.8.12.1.6

Parameter: ISDN Numbering Type

Path: Dialup > Local Phone Numbers > ISDN Local Phone Lines > **Local Phones** > ISDN Local Phone Numbers

Default: Unknown

Options: Unknown │ International │ National │ Specific │ Subscriber │ Abbreviated

Function: Indicates the standard that the phone number follows. The router passes this information to the ISDN switch.

Instructions: Accept the default value, Unknown, unless your service provider explicitly instructs you to use another value.

MIB Object ID: 1.3.6.1.4.1.18.3.5.9.8.12.1.9

Parameter:	**ISDN Numbering Plan**
Path:	Dialup > Local Phone Numbers > ISDN Local Phone Lines > **Local Phones** > ISDN Local Phone Numbers
Default:	Telephony
Options:	Unknown | Telephony | X121 | Telex | Standard | Private
Function:	Indicates the standard that the phone number plan follows. The router passes this information to the ISDN switch.
Instructions:	If you set the Switch Type parameter to BRI NTT, BRI KDD, or BRI NI1, select the value, Unknown. For all other switches, Site Manager uses the default value Telephony. Accept Telephony unless your service provider instructs otherwise.
MIB Object ID:	1.3.6.1.4.1.18.3.5.9.8.12.1.10

Outgoing Phone List Parameters

Parameter:	**Outgoing Phone Number**
Path:	Dialup > Demand/Backup/Bandwidth On Demand Circuits: **Demand Circuits**: PPP or FR Circuits > PPP or FR Demand Circuits > **Phone Out** > Outgoing Phone List > **Add** > Phone Number **Backup Circuits**: PPP or Frame Relay > Primary Circuit Definition or FR Primary Interface Definition > **Phone Out** > Outgoing Phone List > **Add** > Phone Number **Bandwidth Circuits**: Bandwidth On Demand Circuit Definition > **Phone Out** > Outgoing Phone List > **Add** > Phone Number
Default:	None
Options:	Up to 25 numeric characters
Function:	Specifies the telephone number of the remote router.
Instructions:	Enter the telephone number of the remote router. Do not enter space, special, or alphabetic characters in the telephone number.
MIB Object ID:	1.3.6.1.4.1.18.3.5.1.4.6.1.4

Parameter:	**Outgoing Phone Ext/SubAddr**
Path:	Dialup > Demand/Backup/Bandwidth On Demand Circuits: **Demand Circuits**: PPP or FR Circuits > PPP or FR Demand Circuits > **Phone Out** > Outgoing Phone List > **Add** > Phone Number **Backup Circuits**: PPP or Frame Relay > Primary Circuit Definition or FR Primary Interface Definition > **Phone Out** > Outgoing Phone List > **Add** > Phone Number **Bandwidth Circuits**: Bandwidth On Demand Circuit Definition > **Phone Out** > Outgoing Phone List > **Add** > Phone Number
Default:	None
Options:	Up to 25 numeric characters
Function:	For V.25bis, Hayes, and ISDN calls, specifies a subaddress or extension for a phone number, further identifying the remote router. For ISDN calls, this subaddress is useful when there are several routers at a destination site, but the ISDN provider only assigns the destination one phone number. An incoming call must specify the number and subaddress to reach a specific router.
Instructions:	Enter an extension/subaddress of up to 25 characters. Do not enter space, special, or alphabetic characters in the telephone number.
MIB Object ID:	1.3.6.1.4.1.18.3.5.1.4.6.1.5

Parameter:	**Outgoing Phone Delimiter**
Path:	Dialup > Demand/Backup/Bandwidth On Demand Circuits: **Demand Circuits**: PPP or FR Circuits > PPP or FR Demand Circuits > **Phone Out** > Outgoing Phone List > **Add** > Phone Number **Backup Circuits**: PPP or Frame Relay > Primary Circuit Definition or FR Primary Interface Definition > **Phone Out** > Outgoing Phone List > **Add** > Phone Number **Bandwidth Circuits**: Bandwidth On Demand Circuit Definition > **Phone Out** > Outgoing Phone List > **Add** > Phone Number
Default:	None
Options:	Any string of up to five characters. An example of a single-character delimiter is a backslash (\).
Function:	For V.25bis calls only, this delimiter separates the phone number from the extension.
Instructions:	Enter a delimiter if the remote device requires one between the phone number and the extension. Use a character or set of characters that the remote device accepts.
MIB Object ID:	1.3.6.1.4.1.18.3.5.1.4.6.1.6

Parameter: **Outgoing Phone Number Type**

Path: Dialup > Demand/Backup/Bandwidth On Demand Circuits:

Demand Circuits: PPP or FR Circuits > PPP or FR Demand Circuits > **Phone Out** > Outgoing Phone List > **Add** > Phone Number

Backup Circuits: PPP or Frame Relay > Primary Circuit Definition or FR Primary Interface Definition > **Phone Out** > Outgoing Phone List > **Add** > Phone Number

Bandwidth Circuits: Bandwidth On Demand Circuit Definition > **Phone Out** > Outgoing Phone List > **Add** > Phone Number

Default: ISDN or Dial Sync

Options: Dial Sync | Dial Async | ISDN

Function: Distinguishes whether the phone number is for a V.25bis or Hayes connection or a direct ISDN network connection. Additionally, it indicates whether the V.25bis number is for a synchronous or asynchronous interface.

Instructions: Choose an option as follows:

Dial Sync or **Dial Async** if the router is using V.25bis signaling.

Dial Async if the router is using Hayes signaling.

ISDN if the router establishes the connection over an ISDN line. You must also supply values for the ISDN Numbering Type and Numbering Plan parameters.

If you have a line pool that combines ISDN, V.25bis, and Hayes signaling, the destination phone number for some lines may be the same. If this is the case, you need to enter the destination phone number twice, once as type **ISDN** and once as type **Dial Sync** or **Dial Async**. The router then has two lines to dial the call.

MIB Object ID: 1.3.6.1.4.1.18.3.5.1.4.6.1.7

Parameter: **ISDN Numbering Type**

Path: Dialup > Demand/Backup/Bandwidth On Demand Circuits:

Demand Circuits: PPP or FR Circuits > PPP or FR Demand Circuits > **Phone Out** > Outgoing Phone List

Backup Circuits: PPP or Frame Relay > Primary Circuit Definition or FR Primary Interface Definition > **Phone Out** > Outgoing Phone List

Bandwidth Circuits: Bandwidth On Demand Circuit Definition > **Phone Out** > Outgoing Phone List

Default: Unknown

Options: Unknown │ International │ National │ Specific │ Subscriber │ Abbreviated

Function: This parameter indicates the standard that the phone number follows. The router passes this information to the ISDN switch.

Instructions: Accept the default value, Unknown, unless your service provider explicitly instructs you to use another value.

MIB Object ID: 1.3.6.1.4.1.18.3.5.1.4.6.1.8

Parameter: **ISDN Numbering Plan**

Path: Dialup > Demand/Backup/Bandwidth On Demand Circuits:

Demand Circuits: PPP or FR Circuits > PPP or FR Demand Circuits > **Phone Out** > Outgoing Phone List

Backup Circuits: PPP or Frame Relay > Primary Circuit Definition or FR Primary Interface Definition > **Phone Out** > Outgoing Phone List

Bandwidth Circuits: Bandwidth On Demand Circuit Definition > **Phone Out** > Outgoing Phone List

Default: Telephony

Options: Unknown │ Telephony │ X121 │ Telex │ Standard │ Private

Function: This parameter indicates the standard that the phone number plan follows. The router passes this information to the ISDN switch.

Instructions: If you set the Switch Type parameter to BRI NTT, BRI KDD, or BRI NI1 select the value Unknown. For all other switch types, Site Manager uses the default, Telephony. Accept Telephony unless your service provider explicitly instructs you to use another value.

MIB Object ID: 1.3.6.1.4.1.18.3.5.1.4.6.1.9

Parameter: Adaption Rate

Path: Dialup > Demand/Backup/Bandwidth On Demand Circuits:

Demand Circuits: PPP or FR Circuits > PPP or FR Demand Circuits > **Phone Out** > Outgoing Phone List

Backup Circuits: PPP or Frame Relay > Primary Circuit Definition or FR Primary Interface Definition > **Phone Out** > Outgoing Phone List

Bandwidth Circuits: Bandwidth On Demand Circuit Definition > **Phone Out** > Outgoing Phone List

Default: 64K

Options: 64K | 56K

Function: For ISDN calls only, specifies the rate at which the local router wants to send data to the remote destination.

Instructions: Enter a value of 56K if the connections to the destination device only support this rate; otherwise, accept the default, 64K. If you are unsure of your network connections, ask your network provider.

If the value of this parameter is less than the value of the Global Adaption Rate parameter, then this value overrides the Global Adaption Rate value. For example, if this parameter is set to 56 Kb/s and the Global Adaption Rate is set to 64 Kb/s, the router uses the rate of 56 Kb/s for the outgoing call. If the value of the parameters is equal, or only the Global Adaption Rate parameter is set, the router uses the global value and ignores the outgoing phone number's value.

If no value is set for either parameter, the router uses the default, 64 Kb/s.

MIB Object ID: 1.3.6.1.4.1.18.3.5.1.4.6.1.10

Parameter: **Remote Pool Type**

Path: Dialup > Demand/Backup/Bandwidth On Demand Circuits:

Demand Circuits: PPP or FR Circuits > PPP or FR Demand Circuits > **Phone Out** > Outgoing Phone List

Backup Circuits: PPP or Frame Relay > Primary Circuit Definition or FR Primary Interface Definition > **Phone Out** > Outgoing Phone List

Bandwidth Circuits: Bandwidth On Demand Circuit Definition > **Phone Out** > Outgoing Phone List

Default: Dial and Bandwidth on Demand

Options: Dial on Demand | Bandwidth on Demand | Dial and Bandwidth on Demand

Function: Specifies whether the remote router's line associated with the outgoing phone number is in a demand pool, bandwidth pool, or both. The router then uses only the outgoing phone numbers whose values for this parameter match the pool type of the destination connection. This parameter is for applications that use bandwidth-on-demand to aid congested demand circuits.

By configuring the Remote Pool Type parameter, you prevent the local circuit from using a phone number associated the wrong type of remote pool. If a demand circuit places a call to a bandwidth pool, the remote router terminates the connection.

Instructions: Enter the type of remote line pool associated with the outgoing phone number. Use the following guidelines:

- Enter Dial on Demand if the line connected to the remote router is only in a demand pool.
- Enter Bandwidth on Demand if the line connected to the remote router is only in a bandwidth pool.
- Enter Dial and Bandwidth on Demand if the line connected to the remote router is in a demand pool and a bandwidth pool.

MIB Object ID: 1.3.6.1.4.1.18.3.5.1.4.6.1.11

Parameter: **Connection Type**

Path: Dialup > Demand/Backup/Bandwidth On Demand Circuits:

Demand Circuits: PPP or FR Circuits > PPP or FR Demand Circuits > **Phone Out** > Outgoing Phone List

Backup Circuits: PPP or Frame Relay > Primary Circuit Definition or FR Primary Interface Definition > **Phone Out** > Outgoing Phone List

Bandwidth Circuits: Bandwidth On Demand Circuit Definition > **Phone Out** > Outgoing Phone List

Default: Multiple

Options: Single | Multiple

Function: Indicates whether the router uses the phone number for a single call or multiple calls for applications that use bandwidth-on-demand to aid congested demand circuits.

If you select Single, the router checks whether this phone number is already in use for a circuit on the same slot. If the remote device is already busy, the router does not attempt to place the call using this number. Choosing the Single option is particularly important if the line is connected to an external device such as a modem. If the router places a call to device that is busy, it takes a long time before the router determines that the device is unavailable. By selecting Single, you eliminate this loss of time.

If you select Multiple, the router can use the phone number for many calls. For example, if you are using PRI service, you have many channels that can use the same phone number to place a call. Therefore, you would select Multiple for this parameter.

Instructions: Choose Single if the remote destination can only support a single connection with this outgoing phone number. If a circuit on the same slot is already using this phone number, the router will use another phone number in the list. Otherwise, accept the default, Multiple.

MIB Object ID: 1.3.6.1.4.1.18.3.5.1.4.6.1.12

Parameter: **Channel Bandwidth Type**

Path: Dialup > Demand/Backup/Bandwidth On Demand Circuits:

Demand Circuits: PPP or FR Circuits > PPP or FR Demand Circuits > **Phone Out** > Outgoing Phone List

Backup Circuits: PPP or Frame Relay > Primary Circuit Definition or FR Primary Interface Definition > **Phone Out** > Outgoing Phone List

Bandwidth Circuits: Bandwidth On Demand Circuit Definition > **Phone Out** > Outgoing Phone List

Default: BChannel

Options: BChannel │ Multirate

Function: Determines whether this call uses multirate service. This parameter is only applicable for PRI on an MCT1 or QMCT1 Link Module.

Instructions: If you purchased multirate service from your service provider, select Multirate. Otherwise, accept the default, BChannel.

MIB Object ID: 1.3.6.1.4.1.18.3.5.1.4.6.1.13

Parameter: **Aggregate Bandwidth**

Path: Dialup > Demand/Backup/Bandwidth On Demand Circuits:

Demand Circuits: PPP or FR Circuits > PPP or FR Demand Circuits > **Phone Out** > Outgoing Phone List

Backup Circuits: PPP or Frame Relay > Primary Circuit Definition or FR Primary Interface Definition > **Phone Out** > Outgoing Phone List

Bandwidth Circuits: Bandwidth On Demand Circuit Definition > **Phone Out** > Outgoing Phone List

Default: 128K (2*64K)

Options: 128K (2*64K) to 1472K (23*64K)

Function: Determines the total bandwidth, that is, the number of B channels in use for this PRI multirate call.

Instructions: Select the number of B channels the router should use for calls to this remote destination. Remember that the call will fail if there are not enough channels available in the bandwidth pool.

MIB Object ID: 1.3.6.1.4.1.18.3.5.1.4.6.1.14

Parameter: **Outgoing Phone Prefix**

Path: Dialup > Demand/Backup/Bandwidth On Demand Circuits:

Demand Circuits: PPP or FR Circuits > PPP or FR Demand Circuits > **Phone Out** > Outgoing Phone List > **Add** > Phone Number

Backup Circuits: PPP or Frame Relay > Primary Circuit Definition or FR Primary Interface Definition > **Phone Out** > Outgoing Phone List > **Add** > Phone Number

Bandwidth Circuits: Bandwidth On Demand Circuit Definition > **Phone Out** > Outgoing Phone List > **Add** > Phone Number

Default: ATDT

Options: Any valid AT command string.

Function: For asynchronous PPP connections only, this parameter specifies a prefix that the router sends to the modem to initiate dialing.

Instructions: Accept the default, ATDT, or enter a valid AT initialization command. Refer to Appendix E for a list of AT initialization commands for the ARN. Your modem may use a different set of commands, so refer to the manual for that modem.

MIB Object ID: 1.3.6.1.4.1.18.3.5.1.4.6.1.15

Incoming Phone List Parameters

Parameter: **Incoming Phone Number**

Path: Dialup > Incoming Phone Numbers > Incoming Phone List > **Add** > Phone Number

Default: None

Options: Up to 25 numeric characters

Function: Specifies the telephone number of the remote router.

Instructions: Enter the telephone number of the remote router. Do not enter space, special, or alphabetic characters in the telephone number.

MIB Object ID: 1.3.6.1.4.1.18.3.5.1.4.7.1.3

Parameter: **Incoming Phone Ext/SubAddr**

Path: Dialup > Incoming Phone Numbers > Incoming Phone List > **Add** > Phone Number

Default: None

Options: Up to 25 numeric characters

Function: Specifies a subaddress for a main phone number that further identifies the remote router. This subaddress is useful when you have several routers at a destination site, but the ISDN provider assigns only one phone number to that destination site. An incoming call must specify the number and the subaddress to reach a specific router.

Instructions: Enter the extension/subaddress. Do not enter space, special, or alphabetic characters in the telephone number.

MIB Object ID: 1.3.6.1.4.1.18.3.5.1.4.7.1.4

Parameter:	**Callback Demand Circuit Name**
Path:	Dialup > Incoming Phone Numbers > Incoming Phone List
Default:	None
Options:	Available callback demand circuits
Function:	This parameter is only for callback service. When the Callback Mode parameter value is Server One Charge or Server One Charge Call ID, this parameter specifies the circuit that the server uses to call back the client.
Instructions:	Click on the Values button. Site Manager displays a list of available callback circuits. Select the circuit you want and click on OK.
MIB Object ID:	1.3.6.1.4.1.18.3.5.1.4.7.1.9

Caller Resolution Table Parameters

Parameter: **Caller Name**

Path: Dialup > Caller Resolution Table > **Add** > Caller Name and Secret/Password

Default: None

Options: Any text string; maximum of 20 characters

Function: This name is part of the incoming call and informs the local router of the remote router's identity.

Instructions: Enter a text string no longer than 20 characters that identifies a remote router. If you configure CHAP as the authentication protocol, you must enter the remote router's CHAP name. If you configure PAP, you must enter the remote router's PAP ID.

MIB Object ID: 1.3.6.1.4.1.18.3.5.9.2.3.1.2

Parameter: **CHAP Secret**

Path: Dialup > Caller Resolution Table > **Add** > Caller Name and Secret/Password

Default: Unsecured

Options: Any text string; maximum of 20 characters

Function: Specifies the CHAP Secret you assign to this interface. The CHAP secret is for identification and security purposes, and it must be the same on both sides of the connection.

When one router places a call to another router, an authentication process takes place. During this phase, the routers exchange challenge packets that include the CHAP secret. Both routers on a link must have the same secret to correctly calculate responses to the challenges.

Instructions: If you configure CHAP as the authentication protocol, specify the CHAP secret. If not, ignore this parameter.

MIB Object ID: 1.3.6.1.4.1.18.3.5.9.2.3.1.4

Parameter: PAP Password

Path: Dialup > Caller Resolution Table > **Add** > Caller Name and Secret/Password

Default: None

Options: Any text string; maximum of 25 characters

Function: Specifies the PAP password you assign to this interface. The PAP password is for identification and security purposes, and must be the same on both sides of the connection.

During the authentication phase, all Password Authenticate-Request messages that the calling router sends to the called router must include the correct password. If the password is not correct, the called router sends an Authenticate-Negative Acknowledgment (Authenticate-NAK) message and the calling router does not activate the connection.

Instructions: If you configured PAP as the authentication protocol, specify a unique PAP password. If not, ignore this parameter.

MIB Object ID: 1.3.6.1.4.1.18.3.5.9.2.3.1.5

Parameter: Local Circuit

Path: Dialup > Caller Resolution Table

Default: None

Options: Available demand, primary, or bandwidth circuit

Function: Identifies a previously configured demand, primary, or bandwidth circuit. You assign this circuit to a remote router, which you specify in the Caller Name parameter. When the local router receives a call from the remote router, it matches the remote router's CHAP name or PAP ID with a caller name in the caller resolution table. The router then activates the circuit assigned to that remote router.

If you enter a value for this parameter, you cannot enter a value for the Local Group parameter.

Instructions: Select a circuit from the Local Circuit List window. Site Manager automatically supplies the value for this parameter.

MIB Object ID: 1.3.6.1.4.1.18.3.5.9.2.3.1.3

Parameter: Local Group

Path: Dialup > Caller Resolution Table > **Add** > Caller Name and Secret/Password

Default: 0

Options: 0 to 1000

Function: Identifies a previously configured demand circuit group. You assign this demand circuit group to a remote router, which you specify in the Caller Name parameter. When the local router receives a call from the remote router, it matches the remote router's CHAP name or PAP ID with a caller name in the caller resolution table. The router then activates a circuit from the demand circuit group assigned to that remote router.

Instructions: Enter the ID number of the demand circuit group that the router should use when it receives an incoming call. You assign this group to the remote router specified in the Caller Name parameter. Accept the default, 0, if you configure a individual local circuit.

If you enter a value for this parameter, you cannot enter a value for the Local Circuit parameter.

MIB Object ID: 1.3.6.1.4.1.18.3.5.9.2.3.1.6

Appendix B
Configuration Examples

This appendix provides examples for configuring the following applications:

- Dial-on-demand using V.25bis signaling
- Dial-on-demand over an ISDN network
- Dial backup using Raise DTR signaling with PPP and Bay Networks Standard over the primary line
- Dial backup over an ISDN network with PPP, Bay Networks Standard, and Frame Relay over the primary line

These examples include parameters whose defaults you need to change for proper configuration. A sample network illustration shows each type of dial configuration. Each illustration is followed by a set of tables that include the Site Manager window path to access the parameters and the correct parameter values. All paths assume that you begin at the Configuration Manager window.

The ISDN examples (page B-6 and page B-18) assume the following:

- All BRI connections use a National ISDN 1 (NI1) switch.
- There is no incoming call filtering.
- Sending complete IEs are not used for call setup.
- The adaption rate is 64 Kb/s.
- CHAP is the PPP authentication protocol.
- IP is the only LAN protocol configured.
- The Ethernet segments shown in the network illustration are not configured.
- Only one phone number and SPID are used. (BRI lines usually have two phone numbers and SPIDs.)

We assume that you are familiar with the configuration procedures for dial services. Refer to the configuration chapters for details. Refer to *Configuring and Managing Routers with Site Manager* for more information about setting up an interface.

Dial-on-Demand with PPP

Figure B-1 shows Routers 4 and 7 connected via a demand line. The demand line uses PPP and V.25bis signaling.

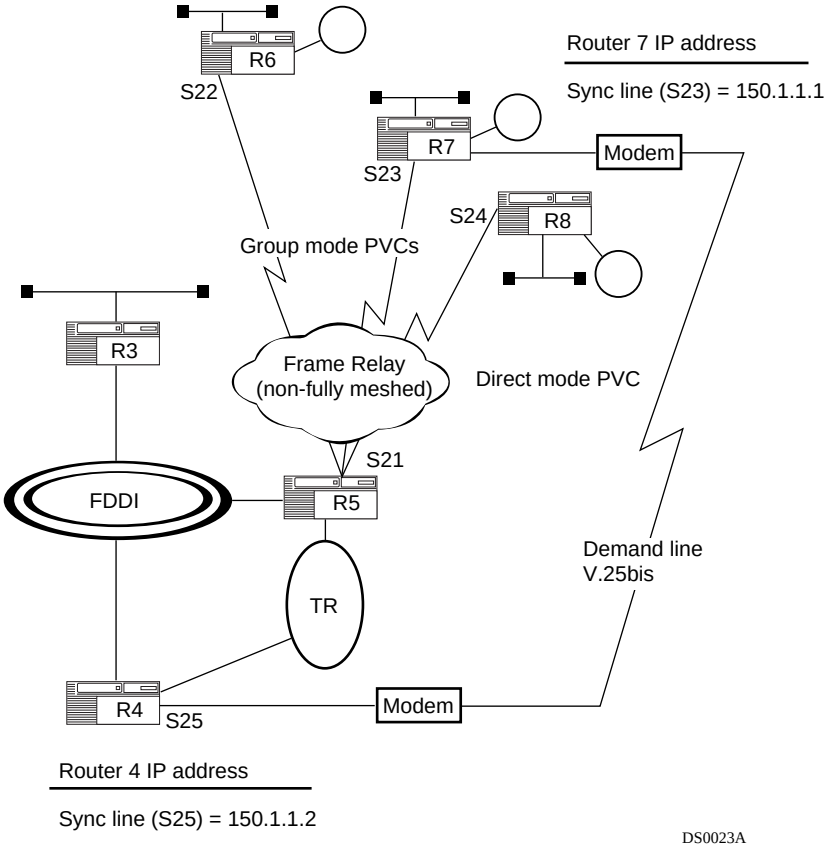


Figure B-1. Dial-on-Demand Configuration with PPP

Configuration of Routers 4 and 7

Configure Routers 4 and 7 as follows:

1. **Select a synchronous link module.**
2. **From the Configuration Manager window, click on a COM connector.**
3. **Follow the path to the configuration windows and set the parameters according to Tables B-1 through B-7.**

Note: These tables list only the parameter defaults you must change.

Demand Pool Configuration

Path: Select Dialup > Demand Pools

Table B-1. Demand Pools Parameter

Parameter	Router 4 (S25)	Router 7 (S23)
Pool ID	1	1

After entering a demand pool ID, the Demand Lines Definition window appears. Click on an available COM connector. Site Manager displays the Choose WAN Serial Interface Type window, where you determine whether you want to use Sync or Async communication. Sync is the default, so no changes are needed.

Next, Site Manager displays the Line Media Type window.

Path: Demand Lines Definition > Line Media Type

Table B-2. Line Media Type Parameters

Parameter	Router 4 (S25)	Router 7 (S23)
Line Media Type	V.25bis	V.25bis
Cable Type	Default	Default
Priority	Default	Default

After you configure the line media type parameters, return to the Configuration Manager window.

Demand Circuit Configuration

Once the demand pool is configured, configure the demand circuits. Select Dialup > Demand Circuits. Site Manager displays the Demand Pools window. Click on PPP Circuits. Site Manager displays the PPP Demand Circuits window.

The PPP Demand Circuits window has a Protocols button in the top left corner. Select Protocols > Add/Delete to configure protocols for the demand circuit. In this example, IP is the only protocol configured.

Path: Protocols > Select Protocols

Table B-3. IP Parameters

Parameter	Router 4 (S25)	Router 7 (S23)
IP Address	150.1.1.2	150.1.1.1
Subnet Mask	255.255.255.0	255.255.255.0

Path: IP > IP Adjacent Host

Table B-4. IP Adjacent Host Parameter

Parameter	Router 4 (S25)	Router 7 (S23)
IP Adjacent Host	150.1.1.1	150.1.1.2

Path: IP Adjacent Host > PPP Demand Circuits

Table B-5. PPP Demand Circuits Parameters

Parameter	Router 4 (S25)	Router 7 (S23)
CHAP Local Name	BLN1 (case-sensitive)	BLN2 (case-sensitive)
CHAP Secret	East (case-sensitive)	East (case-sensitive)
Connection Mode	Default (Collision Master)	Collision Slave

Outgoing Phone List Configuration

From the PPP Demand Circuits window, click on Phone Out to display the Outgoing Phone List window.

Path: Outgoing Phone List > Phone Number

Table B-6. Outgoing Phone List Parameter

Parameter	Router 4 (S25)	Router 7 (S23)
Outgoing Phone Number	4362323 (Do not use hyphens or other nonnumeric characters.)	4368989 (Do not use hyphens or other nonnumeric characters.)

Caller Resolution Table Configuration

After configuring the demand circuits, configure the caller resolution table.

Path: Dialup > Caller Resolution Table > Caller Name and Secret/Password

Table B-7. Caller Resolution Table Parameters

Parameter	Router 4 (S25)	Router 7 (S23)
Caller Name	BLN2	BLN1
CHAP Secret	East	East

Path: Caller Name and Secret/Password > Local Circuit List

The configured circuits are listed in the Local Circuit List window. Choose the demand circuit you created earlier.

Dial-on-Demand for an ISDN Network

Figure B-2 illustrates dial-on-demand configured for an ISDN network. In this configuration:

- The BLN is using an MCT1 card (Port 2) for its PRI interface. The ISDN switch type is PRI 5ESS.
- The IP static route configurations are not listed for the Ethernet interfaces. (Typically, there would be static routes.)

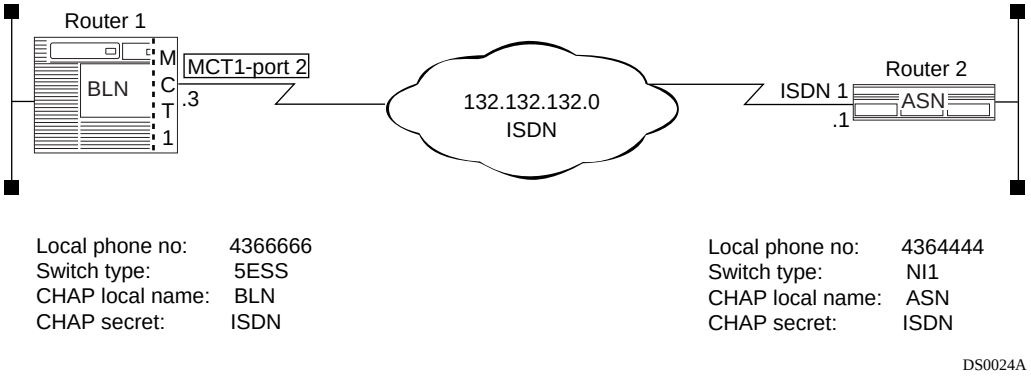


Figure B-2. Dial-on-Demand for an ISDN Network

Configuration of Router 1

To configure Router 1:

1. **Select an MCT1 Link Module.**
2. **From the Configuration Manager window, click on the MCT1-2 connector.**
3. **Follow the path to the configuration windows and set the parameters according to Tables B-8 through B-17.**

Configuration of Router 2

To configure Router 2:

1. **Select an ISDN/BRI Net Module.**
2. **From the Configuration Manager window, click on an ISDN1 connector.**
3. **Follow the path to the configuration windows and set the parameters according to Tables B-8 through B-17.**

Note: These tables list only the parameter defaults you must change.

Port Application Mode Configuration

Begin by setting the Port Application Mode parameter.

Path: MCT1 or MCE1 Connector > Port Application Mode

Table B-8. Port Application Mode Parameter

Parameter	Router 1 (MCT1-2)	Router 2 (ISDN1)
Port Application Mode	PRI	Default (Dialup - 2B + D)

Path: Port Application Mode > Clock Parameters

Table B-9. MCT1 Clock Parameter (Router 1 only)

Parameter	Router 1 (MCT1-2)	
Primary Clock	Port 2 Ext Loop	

The Port Parameters window appears next. Accept the default values.

Path: MCT1 or MCE1 Port Parameters > PRI Timeslots

Click on Select All in the PRI Timeslots window.

If you are using selective PRI service (that is, some B channels are blocked), the timeslots that you configure as B channels should be the same channels assigned by the switch provider. For example, if the provider assigns you channels 1 to 10, configure timeslots 1 to 10 as B channels.

The PRI Logical Lines window appears automatically. Accept the default values.

Demand Pool Configuration

Path: Dialup > Demand Pools

Table B-10. Demand Pools Parameter

Parameter	Router 1 (MCT1-2)	Router 2 (ISDN1)
Pool ID	1	1

After entering a demand pool ID, the Demand Lines Definition window appears automatically. Click on either the MCT1-2 connector (Router 1) or the ISDN1 connector (Router 2). Site Manager automatically displays the ISDN Switch Configuration window.

Path: Demand Lines Definition > ISDN Switch Configuration

Table B-11. ISDN Switch Configuration Parameter

Parameter	Router 1 (MCT1-2)	Router 2 (ISDN1)
Switch Type	PRI 5ESS	NI1

The ISDN Logical Lines window appears next. Accept the default values.

Demand Circuit Configuration

Once the demand pool is configured, the next step is to configure demand circuits.

Path: Dialup > Demand Circuits > PPP Demand Circuits

Table B-12. PPP Demand Circuits Parameters

Parameter	Router 1 (MCT1-2)	Router 2 (ISDN1)
CHAP Local Name	BLN (case-sensitive)	ASN (case-sensitive)
CHAP Secret	ISDN (case-sensitive)	ISDN (case-sensitive)
Connection Mode	Default (Collision Master)	Collision Slave

Outgoing Phone List

From the PPP Demand Circuits window, click on Phone Out to open the Outgoing Phone List window.

Path: Outgoing Phone List > Phone Number

Table B-13. Outgoing Phone List Parameter

Parameter	Router 1 (MCT1-2)	Router 2 (ISDN1)
Outgoing Phone Number	4364444 (Do not use hyphens or other nonnumeric characters.)	4366666 (Do not use hyphens or other nonnumeric characters.)
Note: The ISDN Numbering Plan and ISDN Numbering Type parameters default to the correct settings based on the switch type you configured. Do not change these parameters unless you receive explicit instructions from your service provider.		

Protocol Configuration

Once you return to the PPP Demand Circuits window from the Outgoing Phone List window, select the protocol for this application. The Protocols button is located in the top left corner of the PPP Demand Circuits window.

Path: Protocols > Select Protocols

Table B-14. IP Parameters

Parameter	Router 1 (MCT1-2)	Router 2 (ISDN1)
IP Address	132.132.132.3	132.132.132.1
Subnet Mask	255.255.255.0	255.255.255.0

After entering an IP address, you specify an IP adjacent host address.

Path: IP Configuration > IP Adjacent Host

Table B-15. IP Adjacent Host Parameter

Parameter	Router 1 (MCT1-2)	Router 2 (ISDN1)
IP Address	132.132.132.1	132.132.132.3

Caller Resolution Table Configuration

After configuring the demand circuits, configure the caller resolution table. Select Dialup > Caller Resolution Table.

Path: Caller Resolution Table > Caller Name and Secret/Password

Table B-16. Caller Resolution Table Parameters

Parameter	Router 1 (MCT1-2)	Router 2 (ISDN1)
Caller Name	ASN	BLN
CHAP Secret	ISDN	ISDN

Click on OK. Site Manager displays the Local Circuit List window.

Path: Caller Name and Secret/Password > Local Circuit List window

The configured circuits are listed in the Local Circuit List window. Choose the demand circuit you created earlier.

Local Phone Number Configuration

Finally, configure each router's phone number.

Path: Dialup > Local Phone Numbers

Site Manager displays the ISDN Local Phone Lines window. Click on Local Phones. Site Manager displays the ISDN Local Phone Numbers window.

Path: ISDN Local Phone Numbers > Phone Number

Table B-17. Local Phone Number Parameters

Parameter	Router 1 (MCT1-2)	Router 2 (ISDN1)
Directory Number	4366666	4364444
SPID	N/A	50843644440000
Note: No SPID is needed for a PRI line. A SPID is needed for a BRI line using an NI1 switch.		

Dial Backup with PPP on the Primary Line

Figure B-3 shows Routers 1 and 2 connected via a synchronous line running PPP. You designate this synchronous connection as a primary connection, so if it fails, the router provides a dial backup connection.

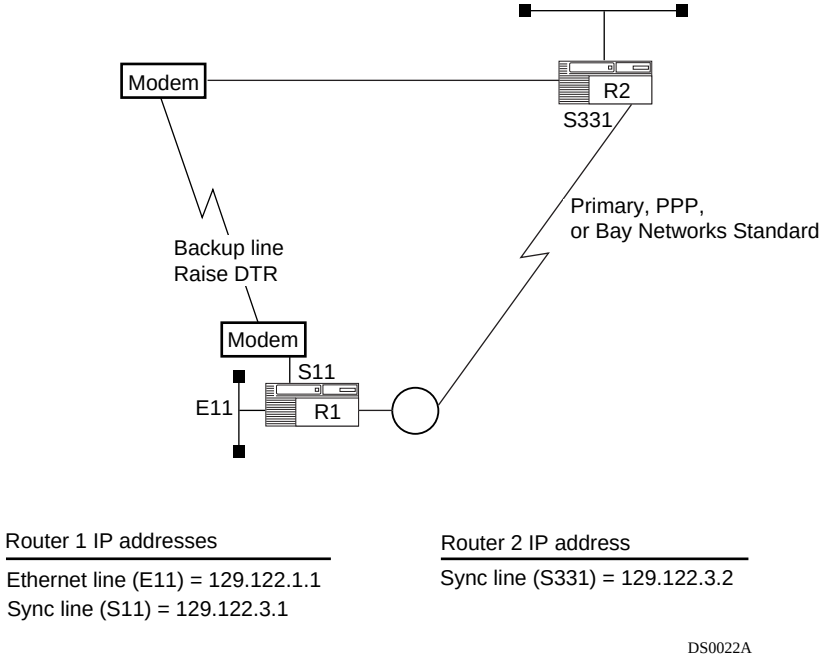


Figure B-3. Dial Backup Configuration with PPP

Configuration of Router 1

To configure Router 1:

1. **Configure a leased, synchronous interface named S11.**
2. **Select PPP as the WAN protocol.**
3. **Select IP/RIP as the LAN protocol and configure the interface as follows:**
   - IP Address: 129.122.3.1
   - IP Adjacent Host Address: 129.122.3.2

4. **From the Configuration Manager window, click on a COM connector.**
5. **Follow the path to the configuration windows and set the parameters according to Tables B-18 through B-22.**

Configuration of Router 2

To configure Router 2:

1. **Configure a leased, synchronous interface named S331.**
2. **Select PPP as the WAN protocol.**
3. **Select IP/RIP as the LAN protocol and configure the interface as follows:**
   - IP Address: 129.122.3.2
   - IP Adjacent Host Address: 129.122.3.1
4. **From the Configuration Manager window, click on a COM connector.**
5. **Follow the path to the configuration windows and set the parameters according to Tables B-18 through B-22.**

Note: These tables list only the parameter defaults you must change.

Backup Pool Configuration

First, configure the backup pools.

Path: Dialup > Backup Pools

Table B-18. Backup Pools Parameter

Parameter	Router 1 (S11)	Router 2 (S331)
Pool ID	1	1

After you enter a backup pool ID, the Backup Lines Definition window appears. Click on a COM connector. Site Manager displays the WAN Serial Interface Type window, where you determine whether you want to use Sync or Async communication. Sync is the default, so no changes are needed.

Next, Site Manager displays the Line Media Type window. In this application, Raise DTR, the default, is the signaling method, so no changes are needed. After you configure the line media type parameters, return to the Configuration Manager window.

Backup Circuit Configuration

Once the backup pool is configured, configure the backup circuits.

Path: Dialup > Backup Circuits > PPP

Remember that you do not actually configure a backup circuit; designate a leased circuit as a primary circuit. If this circuit fails, the router provides a backup circuit that adopts the configuration of the primary circuit.

Path: Primary Circuit Definition (select S11 or S331, then click on Cct Type) > Circuit Options

Table B-19. Circuit Options Parameters

Parameter	Router 1 (S11)	Router 2 (331)
Circuit Type	Primary	Primary
Backup Pool ID	1	1

Return to the Primary Circuit Definition window from the Circuit Options window.

Path: Circuit Options > Primary Circuit Definition

Table B-20. Primary Circuit Definition Parameters

Parameter	Router 1 (S11)	Router 2 (S331)
Backup Mode	Master (default)	Slave
CHAP Local Name	BLN	N/A
CHAP Secret	West	N/A

Outgoing Phone List Configuration

From the Primary Circuit Definition window, click on Phone Out to open the Outgoing Phone List window.

Path: Outgoing Phone List > Phone Number

Table B-21. Outgoing Phone List Parameter

Parameter	Router 1 (S11)	Router 2 (S331)
Outgoing Phone Number	4362222 (Do not use hyphens or other nonnumeric characters.)	4368888 (Do not use hyphens or other nonnumeric characters.)

Caller Resolution Table Configuration

Router 1, the master router, does not require a caller resolution table. Router 1 initiates calls to Router 2, it does not receive them; therefore, Router 1 does not need to verify Router 2's identity. In contrast, Router 1 must have a CHAP name and secret that it places in the call setup message to identify itself to Router 2.

Router 2, the slave router, does require a table entry. Router 2 receives calls from Router 1 and must identify the incoming caller. After configuring the primary and backup circuits, you can configure the caller resolution table.

Path: Dialup > Caller Resolution Table > Caller Name and Secret/Password

Table B-22. Caller Resolution Table Parameters (Router 2 only)

Parameter	Router 1 (S11)	Router 2 (S331)
Caller Name	N/A	BLN
CHAP Secret	N/A	West

Click on OK. Site Manager displays the Local Circuit List window.

Path: Caller Name and Secret/Password > Local Circuit List

The primary circuits are listed in the Local Circuit List window. Choose the circuit you created earlier.

Dial Backup with Standard on the Primary Line

If the primary circuit uses Bay Networks Standard as the WAN protocol (refer to Figure B-3), you must configure a unique value for the MAC Address parameter of the primary IP interface. The router then uses this address as the value of the MAC Address parameter in the IP adjacent host entry for the remote router. Routers on each end of the connection require an IP adjacent host entry that includes the other router's MAC address.

The previous section, "Dial Backup with PPP on the Primary Line" explains how to configure most dial backup parameters, with the exception of the IP parameters listed in Tables B-23 and B-24.

Table B-23. IP Parameter

Parameter	Router 1 S11 (129.122.3.1)	Router 2 S331 (129.122.3.2)
MAC Address	0x000000000001	0x000000000002

Once you configure a MAC address you must configure the IP adjacent host parameters.

Table B-24. IP Adjacent Host Parameters

Parameter	Router 1 S11 (129.122.3.1)	Router 2 S331 (129.122.3.2)
IP Address	129.122.3.2	129.122.3.1
Next Hop Interface Addr	129.122.3.1	129.122.3.2
MAC Address	0x000000000002	0x000000000001

Dial Backup over an ISDN Network

Figure B-4 shows dial backup service over an ISDN network. In this configuration, the primary circuit is using PPP. At the end of this section, there are configuration notes if your application uses Standard or Frame Relay.

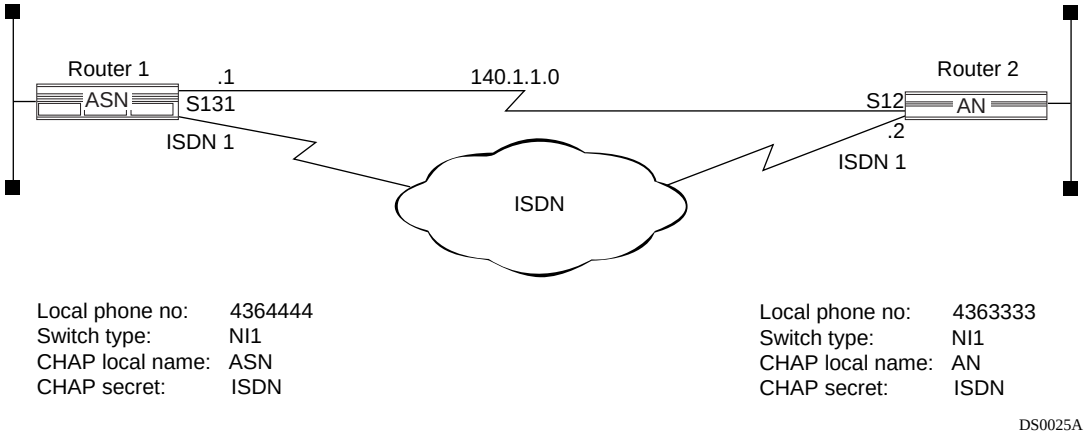


Figure B-4. Dial Backup over an ISDN Network

Configuration of Router 1

To configure Router 1:

1. **Configure a leased, synchronous interface named S131.**
2. **Select PPP as the WAN protocol.**
3. **Select IP/RIP as the LAN protocol and configure the interface as follows:**
   - IP Address: 140.1.1.1
   - Subnet Mask: 255.255.255.0
   - IP Adjacent Host Address: 140.1.1.2
4. **From the Configuration Manager window, click on an ISDN1 connector.**
5. **Follow the path to the configuration windows and set the parameters according to Tables B-25 through B-32.**

Configuration of Router 2

To configure Router 2:

1. **Configure a leased, synchronous interface named S12.**
2. **Select PPP as the WAN protocol.**
3. **Select IP/RIP as the LAN protocol and configure the interface as follows:**
   - IP Address: 140.1.1.2
   - Subnet Mask: 255.255.255.0
   - IP Adjacent Host Address: 140.1.1.1
4. **From the Configuration Manager window, click on an ISDN1 connector.**
5. **Follow the path to the configuration windows and set the parameters according to Tables B-25 through B-32.**

Note: These tables list only the parameter defaults you must change.

Port Application Mode Configuration

First, configure the port application mode.

Path: ISDN1 connector > Port Application

Table B-25. Port Application Parameter

Parameter	Router 1 (S131)	Router 2 (S12)
Port Application Mode	Default (Dialup - 2B + D)	Default (Dialup - 2B + D)

Backup Pool Configuration

Configure the backup pool.

Path: Dialup > Backup Pools

Table B-26. Backup Pools Parameter

Parameter	Router 1 (S131)	Router 2 (S12)
Pool ID	1	1

After entering a backup pool ID, the Backup Lines Definition window appears. Click on the ISDN1 connector. Site Manager automatically displays the ISDN Switch Configuration window.

Path: Backup Lines Definition > ISDN Switch Configuration

Table B-27. ISDN Switch Configuration Parameter

Parameter	Router 1 (S131)	Router 2 (S12)
Switch Type	NI1	NI1

The ISDN Logical Lines window appears next. Accept the default values.

Backup Circuit Configuration

After you configure the backup pool, configure the backup circuits.

Path: Dialup > Backup Circuits

Remember that you do not actually configure a backup circuit; designate a leased circuit as a primary circuit. If this circuit fails, the router provides a backup circuit that adopts the configuration of the primary circuit.

Path: Primary Circuit Definition (select S131 or S12, then click on Cct Type) > Circuit Options

Table B-28. Circuit Options Parameters

Parameter	Router 1 (S131)	Router 2 (S12)
Circuit Type	Primary	Primary
Backup Pool ID	1	1

Return to the Primary Circuit Definition window from the Circuit Options window.

Path: Circuit Options > Primary Circuit Definition

Table B-29. Primary Circuit Definition Parameters

Parameter	Router 1 (S131)	Router 2 (S12)
Backup Mode	Master	Slave
CHAP Local Name	ASN	N/A
CHAP Secret	ISDN	N/A

Outgoing Phone List

From the Primary Circuit Definition window, click on Phone Out to open the Outgoing Phone List window.

Path: Outgoing Phone List > Phone Number window

Table B-30. Outgoing Phone List Parameter

Parameter	Router 1 (S131)	Router 2 (S12)
Outgoing Phone Number	4363333 (Do not use hyphens or other nonnumeric characters.)	4364444 (Do not use hyphens or other nonnumeric characters.)
Note: The ISDN Numbering Plan and ISDN Numbering Type parameters default to the correct values based on the switch type you configured. Do not change these parameters unless you receive explicit instructions from your service provider.		

Caller Resolution Table Configuration

Router 1, the master router, does not require a caller resolution table. Router 1 initiates calls to Router 2, it does not receive them; therefore, Router 1 does not need to verify Router 2's identity. In contrast, Router 1 must have a CHAP name and secret that it places in the call setup message to identify itself to Router 2.

Router 2, the slave router, requires a table entry. Router 2 receives calls from Router 1 and must identify the incoming caller. After configuring the backup circuits, you can configure the caller resolution table.

Path: Dialup > Caller Resolution Table > Caller Name and Secret/Password

Table B-31. Caller Resolution Table Parameters (Router 2 only)

Parameter	Router 1 (S131)	Router 2 (S12)
Caller Name	N/A	ASN
CHAP Secret	N/A	ISDN

Click on OK. Site Manager displays the Local Circuit List window.

Path: Caller Name and Secret/Password > Local Circuit List

The primary circuits are listed in the Local Circuit List window. Choose the primary circuit you created earlier.

Local Phone Number Configuration

Finally, configure each router's phone number.

Path: Dialup > Local Phone Numbers

Site Manager displays the ISDN Local Phone Lines window. Click on Local Phones. Site Manager displays the ISDN Local Phone Numbers window.

Path: ISDN Local Phone Numbers > Phone Number

Table B-32. Local Phone Numbers Parameters

Parameter	Router 1 (S131)	Router 2 (S12)
Directory Number	4364444	4363333
SPID	50843644440000	50843633330000
Note: A SPID is required for a BRI line using an NI1 switch.		

Configuring Dial Backup with Standard or Frame Relay

If the primary circuit uses Standard as the WAN protocol, you must configure a unique value for the MAC Address parameter of the primary IP interface. The router then uses this address as the value of the MAC Address parameter in the IP adjacent host entry for the remote router. Routers on each end of the connection require an IP adjacent host entry that includes the other router's MAC address.

If the primary circuit uses Frame Relay (in direct mode, using A-bit notification) as the WAN protocol, you do not need to configure the MAC address of the primary IP interface. However, you still need to configure an IP adjacent host entry for both routers.

Appendix C
Dial Services Parameter Defaults

Tables C-1 through C-16 list the parameter defaults for dial services. Use Site Manager to edit any of the parameter defaults.

Table C-1. Line Pool Parameters

Parameter	Default
Demand Pool ID	None
Backup Pool ID	None
Bandwidth-On-Demand Pool ID	None
WAN Serial Interface Type	Sync

Table C-2. Line Media Type Parameters

Parameter	Default
Line Media Type	Raise DTR
Cable Type	RS232
Priority	1
Modem Command String	None

Table C-3. Modem Interface Parameters

Parameter	Default
Retry Delay	3 seconds
Redial Count	3 attempts
Ring Indicator	Enable
Debug Mode	Disable
Modem Type	Custom
Modem Init String	AT&F
Modem Command String	None
Speaker Volume	Medium
Speaker Control	On For Call
No. of Rings to Answer	1
V.34 Modem Parameters	
Expert Config	Disabled
Modem Config. String	None
Modem Factory Defaults	Enabled
Originate/Answer	Originate
Phone Number	None
Set Pulse/Tone Dial Default	Tone

Table C-4. Port Application Mode Parameters

Parameter	Default
Port Application Mode (BRI)	Dialup - 2B + D
Port Application Mode (PRI)	NonPRI

Table C-5. Logical Lines Parameter

Parameter	Default
MTU Size	1600 bytes

Table C-6. ISDN Switch Parameters

Parameter	Default
Switch Type	BRI NET3 or PRI Net 5
Incoming Filter	Disable
Sending Complete IE	Disable
Global Adaption Rate	64K
X.25 over ISDN-D Channel	Disable
TEI Type for X.25 over ISDN-D	Fixed
TEI Value for X.25 over ISDN-D	1

Table C-7. ISDN Logical Lines Parameters

Parameter	Default
Pool Channel Count	Available B channels
Pool Channel Priority	1

Table C-8. Local Phone Number Parameters

Parameter	Default
Directory Number	None
Ext/SubAddr	None
Spid	None
Assigned Channel	None
Directory Number Type	Unknown
Directory Number Plan	Unknown

Table C-9. BRI Interface Parameters

Parameter	Default
Acceptable LAPD MTUs	400 bytes
BRI T3 Timer	10 seconds
BRI T4 Timer	750 milliseconds
BRI B Channel Loopback	Disable
BRI Line Type	PTP

Table C-10. Demand Circuit Parameters

Parameter	Default
Demand Pool ID	None
Force Take Down	Disable
Force Dial	Disable
Inactivity Time	60 seconds
Retry Max	2 attempts
Retry Delay	3 seconds
Connection Mode	Collision Master
Auto Demand Termination	Disable
Auto Demand Term. Reset	60 minutes
CHAP Local Name	None
CHAP Secret	Unsecured
PAP Local ID	None
PAP Password	Unsecured
Maximum Up Time	60 minutes
Max UpTime Termination	Disable
UpTime Term. Reset	60 minutes
Days	Weekday
Start Time	0
End Time	2359
Inactivity Timeout	Disable
Availability Mode	Available
Minimum Call Duration	60 seconds
Inactivity Mode	Both Directions
Dial Optimized Routing	Disabled
Outbound Authentication	Enable
Standby Mode	Demand Normal
Standby Failback Mode	None
Manual Standby Action	No Action

(continued)

Table C-10. Demand Circuit Parameters *(continued)*

Parameter	Default
Standby Primary Circuit	None
Callback Mode	Inactive
Callback Server Delay Time (sec)	0
Callback Client Delay Time (sec)	5 seconds
TimeofDay Failback Mode	Automatic
Failback Time (min.)	0

Table C-11. Demand Circuit Group Parameters

Parameter	Default
Pool ID	None
Number of Circuits	None
Caller Name	Unsecured
CHAP Secret	None
PAP Password	None
IP Enable	Disable
Associated IP Address	None

Table C-12. Primary/Backup Circuit Parameters

Parameter	Default
Circuit Type	Normal
Backup Pool ID	None
Backup Mode	Master
CHAP Local Name	None
CHAP Secret	Unsecured
PAP Local ID	None
PAP Password	Unsecured
Maximum Up Time	60 minutes
Max UpTime Termination	Disable
UpTime Term. Reset	60 minutes
Interface Type	Normal
Primary Down Time	5 minutes
Use Backup Interface Filters	Disabled
FR Service Control	Disable (primary/secondary) Enable (primary/shared) Disable (demand)
Hangup on DLCMI Failure	Disable
Service Name	None
Days	Weekday
Start Time	0
End Time	2359
Outbound Authentication	Enable

Table C-13. Bandwidth-on-Demand Circuit Parameters

Parameter	Default
Circuit Type	Normal
BOD Pool ID	None
Bandwidth Mode	Non-Monitor
CHAP Local Name	None
CHAP Secret	Unsecured
PAP Local ID	None
PAP Password	Unsecured
PPP Circuit Mode	Normal
BOD Exam Period	10 (0.10-second intervals)
BOD Fail Threshold	70 percent
BOD Periods to Fail	10 times
Preferred Bandwidth Slot	None
Reserved Bandwidth Slot	None
Maximum Links	4
BOD Recovery Threshold	20 percent
BOD Periods to Recover	10 times
Multilink Fragmentation	Permitted
Fragmentation Trigger Size	256
Outbound Authentication	Enable
Enable (BAP)	Disable
No Phone Number Needed (BAP)	Disable

Table C-14. Outgoing Phone List Parameters

Parameter	Default
Phone Number	None
Phone Ext/SubAddr	None
Phone Delimiter	None
Phone Prefix	ATDT
Phone Number Type	ISDN
ISDN Numbering Type	Unknown
ISDN Numbering Plan	Telephony
Adaption Rate	64K
Remote Pool Type	Dial and Bandwidth-on-Demand
Connection Type	Multiple
Channel Bandwidth Type	BChannel
Aggregate Bandwidth	128K (2*64K)

Table C-15. Incoming Phone List Parameters

Parameter	Default
Phone Number	None
Phone Ext/SubAddr	None
Callback Demand Circuit Name	None

Table C-16. Caller Resolution Table Parameters

Parameter	Default
Local Circuit	None
Caller Name	None
CHAP Secret	Unsecured
PAP Password	Unsecured
Local Group	0

Appendix D
Ordering ISDN Lines in the United States

This appendix provides information for ordering ISDN lines in the United States.

Ordering BRI Lines

When ordering ISDN BRI lines for use in the United States, note the following:

- Configure the B1 and B2 channels for data only.
- Configure the D channel for signaling only.

Table D-1 lists the parameters to set for the AT&T 5ESS switch. Table D-2 lists the parameters to set for the Northern Telecom DMS-100 switch. Your phone company may ask you to provide this information when you order your BRI lines.

Table D-1. BRI Parameters for the AT&T 5ESS Switch

Parameter	Value	Notes
Terminal Type	A	
Number of CSD	2	
Number of CSV	0 or 1	1 if an ISDN phone was connected to the S/T bus
Number of Call Appearances	1	
Display is Y/N	No	
Ringing/Idle Call Appearances	Idle	Default for terminal type A
Autohold is Y/N	No	Default for terminal type A
Onetouch is Y/N	No	Default for terminal type A

Table D-2. BRI Parameters for the Northern Telecom DMS-100 Switch

Parameter	Value	Notes
Signaling	Functional	
Protocol Version	1 or 2	1 is NT1 Custom, 2 is NI-1 (National ISDN-1)
TEI Assignment	Dynamic	
Maximum # of Keys	3	Specify any number equal to or greater than 1
Release Key is N or a Key Number	No	Not relevant for proper operation
Ring Indicator is Y/N	No	Not relevant for proper operation
EKTS is Y/N	No	

Ordering PRI Lines

When ordering ISDN PRI lines for use in the United States, note the following:

- The switch must be a DMS-100, AT&T 5ESS, or AT&T 4ESS switch.
- Configure all 23 B channels for Circuit Switched Data (CSD).
- Configure the D channel for signaling only.
- You cannot run the National ISDN-2 (NI-2) protocol.

Appendix E
AT Initialization Commands for the ARN

Table E-1 lists the AT commands used by the ARN with the internal Modem Adapter Module. Your modem may use a different set of commands, so refer to the manual for your modem.

Table E-1. Summary of AT Modem Initialization Commands

Command	Function
A/	Reexecute command.
A	Go off-hook and attempt to answer a call.
B0	Select V.22 connection at 1200 b/s.
B1	Select Bell 212A connection at 1200 b/s.
C1	Return OK message.
Dn	Dial modifier.
E0	Turn off command echo.
E1	Turn on command echo.
F0	Select auto-detect mode, equivalent to N1 (RC144).
F1	Select V.21 or Bell 103 (RC144).
F2	Reserved (RC144).
F3	Select V.23 line modulation (RC144).
F4	Select V.22 or Bell 212A 1200 b/s line speed (RC144).
F5	Select V.22bis line modulation (RC144).
F6	Select V.32bis or V.32 4800 line modulation (RC144).
F7	Select V.32bis 7200 line modulation (RC144).
F8	Select V.32bis or V.32 9600 line modulation (RC144).

(continued)

Table E-1. Summary of AT Modem Initialization Commands *(continued)*

Command	Function
F9	Select V.32bis 12000 line modulation (RC144).
F10	Select V.32bis 14400 line modulation (RC144).
H0	Initiate a hang-up sequence.
H1	If on-hook, go off-hook and enter command mode.
I0	Report product code.
I1	Report precomputed checksum.
I2	Report OK.
I3	Report firmware revision, model, and interface type.
I4	Report response programmed by an OEM.
I5	Report the country code parameter.
I6	Report modem data pump model and code revision.
I7	Reports the DAA code (W-class models only).
L0	Set low speaker volume.
L1	Set low speaker volume.
L2	Set medium speaker volume.
L3	Set high speaker volume.
M0	Turn speaker off.
M1	Turn speaker on during handshaking, and off while receiving carrier.
M2	Turn speaker on during handshaking and while receiving carrier.
M3	Turn speaker off during dialing and receiving carrier and turn speaker on during answering.
N0	Turn off automode detection.
N1	Turn on automode detection.
O0	Go online.
O1	Go online and initiate a retrain sequence.
P	Force pulse dialing.
Q0	Allow result codes to DTE.
Q1	Inhibit result codes to DTE.
Sn	Select S-Register as default.
Sn?	Return the value of S-Register n.

(continued)

Table E-1. Summary of AT Modem Initialization Commands *(continued)*

Command	Function
=v	Set default S-Register to value v.
?	Return the value of default S-Register.
T	Force DTMF dialing.
V0	Report short form (terse) result codes.
V1	Report long form (verbose) result codes.
W0	Report DTE speed in EC mode.
W1	Report line speed, EC protocol, and DTE speed.
W2	Report DCE speed in EC mode.
X0	Report basic call progress result codes. For example, OK, CONNECT, RING, NO CARRIER (also, for busy, if enabled, and dial tone not detected), NO ANSWER, and ERROR.
X1	Report basic call progress result codes and connection speeds. For example, OK, CONNECT, RING, NO CARRIER (also, for busy, if enabled, and dial tone not detected), NO ANSWER, CONNECT XXXX, and ERROR.
X2	Report basic call progress result codes and connection speeds. For example, OK, CONNECT, RING, NO CARRIER (also, for busy, if enabled, and dial tone not detected), NO ANSWER, CONNECT XXXX, and ERROR.
X3	Report basic call progress result codes and connection rate. For example, OK, CONNECT, RING, NO CARRIER, NO ANSWER, CONNECT XXXX, and ERROR.
X4	Report all call progress result codes and connection rate. For example, OK, CONNECT, RING, NO CARRIER, NO ANSWER, CONNECT XXXX, BUSY, NO DIAL TONE, and ERROR.
Y0	Disable long space disconnect before on-hook.
Y1	Enable long space disconnect before on-hook.
Z0	Restore stored profile 0 after warm reset.
Z1	Restore stored profile 1 after warm reset.
&C0	Force RLSD active regardless of the carrier state.
&C1	Allow RLSD to follow the carrier state.
&D0	Interpret DTR ON-to-OFF transition per &Qn:.
&Q0, &Q5, &Q6	The modem ignores DTR.

(continued)

Table E-1. Summary of AT Modem Initialization Commands *(continued)*

Command	Function
&Q1, &Q4	The modem hangs up.
&Q2, &Q3	The modem hangs up.
&D1	Interpret DTR ON-to-OFF transition per &Qn:.
&Q0, &Q1, &Q4, &Q5, &Q6	Asynchronous escape.
&Q2, &Q3	The modem hangs up.
&D2	Interpret DTR ON-to-OFF transition per &Qn:.
&Q0 through &Q6	The modem hangs up.
&D3	Interpret DTR ON-to-OFF transition per &Qn:.
&Q0, &Q1, &Q4, &Q5, &Q6	The modem performs soft reset.
&Q2, &Q3	The modem hangs up.
&F0	Restore factory configuration 0.
&F1	Restore factory configuration 1.
&G0	Disable guard tone.
&G1	Disable guard tone.
&G2	Enable 1800-Hz guard tone.
&J0	Set S-Register response only for compatibility.
&J1	Set S-Register response only for compatibility.
&K0	Disable DTE/DCE flow control.
&K3	Enable RTS/CTS DTE/DCE flow control.
&K4	Enable XON/XOFF DTE/DCE flow control.
&K5	Enable transparent XON/XOFF flow control.
&K6	Enable both RTS/CTS and XON/XOFF flow control.
&L0	Select dial-up line operation.
&M0	Select direct asynchronous mode.
&M1	Select sync connect with async off-line command mode. *
&M2	Select sync connect with async off-line command mode and enable DTR dialing of directory zero. *
&M3	Select sync connect with async off-line command mode and enable DTR to act as Talk/Data switch.

(continued)

Table E-1. Summary of AT Modem Initialization Commands *(continued)*

Command	Function
&P0	Set 10 p/s pulse dial with 39%/61% make/break.
&P1	Set 10 p/s pulse dial with 33%/67% make/break.
&P2	Set 20 p/s pulse dial with 39%/61% make/break.
&P3	Set 20 p/s pulse dial with 33%/67% make/break.
&Q0	Select direct asynchronous mode.
&Q1	Select sync connect with async off-line command mode. *
&Q2	Select sync connect with async off-line command mode and enable DTR dialing of directory zero. [a]
&Q3	Select sync connect with async off-line command mode and enable DTR to act as Talk/Data switch. *
&Q4	Select Hayes AutoSync mode.
&Q5	Modem negotiates an error corrected link.
&Q6	Select asynchronous operation in normal mode.
&R0	CTS tracks RTS (async) or acts per V.25 (sync).
&R1	CTS is always active.
&S0	DSR is always active.
&S1	DSR acts per V.25.
&T0	Terminate any test in progress.
&T1	Initiate local analog loopback.
&T2	Returns ERROR result code.
&T3	Initiate local digital loopback.
&T4	Allow remote digital loopback.
&T5	Disallow remote digital loopback request.
&T6	Request an RDL without self-test.
&T7	Request an RDL with self-test.
&T8	Initiate local analog loop with self-test.
&V	Display current configurations.
&W0	Store the active profile in NVRAM profile 0.
&W1	Store the active profile in NVRAM profile 1.
&X0	Select internal timing for the transmit clock.

(continued)

Table E-1. Summary of AT Modem Initialization Commands *(continued)*

Command	Function
&X1	Select external timing for the transmit clock.
&X2	Select slave receive timing for the transmit clock.
&Y0	Recall stored profile 0 upon power up.
&Y1	Recall stored profile 1 upon power up.
&Zn=x	Store dial string x (to 34) to location n (0 to 3).
%E0	Disable line quality monitor and auto retrain.
%E1	Enable line quality monitor and auto retrain.
%E2	Enable line quality monitor and fallback/fall forward.
%L	Return received line signal level.
%Q	Report the line signal quality.
+MS	Select modulation.
+H0	Disable RPI.
+H1	Enable RPI and set DTE speed to 19200 b/s.
+H2	Enable RPI and set DTE speed to 38400 b/s.
+H3	Enable RPI and set DTE speed to 57600 b/s.
+H11	Enable RPI+ mode.
-SDR=0	Disable Distinctive Ring.
-SDR=1	Enable Distinctive Ring Type 1.
-SDR=2	Enable Distinctive Ring Type 2.
-SDR=3	Enable Distinctive Ring Type 1 and 2.
-SDR=4	Enable Distinctive Ring Type 3.
-SDR=5	Enable Distinctive Ring Type 1 and 3.
-SDR=6	Enable Distinctive Ring Type 2 and 3.
-SDR=7	Enable Distinctive Ring Type 1, 2, and 3.
-SSE=0	Disable DSVD.
-SSE=1	Enable DSVD.

a. Serial interface operation only.

Index

A

Acceptable LAPD MTUs parameter, A-22
access methods to switched network, ISDN, 2-3
activating secondary lines for bandwidth, 2-24
Adaption Rate parameter, A-95
Address Length parameter, A-65
Address parameter, A-64
adjacent hosts for IP dial connections, 4-9
Aggregate Bandwidth parameter, A-98
Associated IP Address parameter, A-54
asynchronous lines
  for bandwidth-on-demand, 2-22
  for dial backup, 2-13
  for dial-on-demand, 2-4
asynchronous PPP
  advantages, 4-6 to 4-7
  authentication, 4-7
  description, 4-6 to 4-7
AT initialization commands, configuring, 4-7
authentication protocols
  CHAP, 4-1
  PAP, 4-1
authentication types
  one-way, 4-2
  two-way, 4-2
Auto Demand Term. Reset parameter, A-29
Auto Demand Termination parameter, A-29
Availability Mode parameter, A-49

B

B channel
  function, 3-2
  removing from line pool, 8-28, 8-29
  transmission rates, 3-2
backup circuits. *See* dial backup
Backup Mode parameter, A-58
Backup Pool ID parameter, A-4, A-57
backup pools
  backup lines in, 2-17
  description, 2-17
  IDs for, 2-18
Bandwidth Allocation Protocol (BAP)
  configuring, 7-6, 11-10
  description, 7-4
Bandwidth Mode parameter, A-78, A-79
bandwidth-on-demand
  default parameter settings, C-1 to C-10
  for demand circuits, 2-11
  identifying bandwidth pools, 2-23
  implementation notes, 7-1 to 7-8
  introduction, 2-1
  overview, 2-21 to 2-25
  parameters
    Bandwidth Mode, A-78, A-79
    Bandwidth-on-demand Pool ID, A-4
    BOD Exam Period, A-81
    BOD Full Threshold, A-81
    BOD Periods to Fail, A-82
    BOD Periods to Recover, A-84
    BOD Pool ID, A-77, A-79
    BOD Recovery Threshold, A-84
    Cable Type, A-6
    CHAP Secret, A-38
    Circuit Type, A-77

Directory Number, A-87
Ext/SubAddr, A-87
Fragmentation Trigger Size, A-85
Global Adaption Rate, A-19
Incoming Filter, A-18
Line Media Type, A-5
Maximum Links, A-83
Modem Command String, A-9
Multilink Fragmentation, A-85
PAP Local ID, A-39
PAP Password, A-40
Pool Channel Count, A-20
Pool Channel Priority, A-21
Port Application Mode, A-15
PPP Circuit Mode, A-80
Preferred Bandwidth Slot, A-82
Priority, A-6
Reserved Bandwidth Slot, A-83
Sending Complete IE, A-18
SPID, A-88
Switch Type, A-16
WAN Serial Interface Type, A-4
pools, configuring, 1-5
PPP multilink, 7-2
testing the circuit, 7-8

bandwidth-on-demand circuits
activating lines, 2-24
configuring, 1-28
defining role of the router, 7-7
monitoring congestion on the line, 11-4

Bandwidth-on-demand Pool ID parameter, A-4

BAP. *See* Bandwidth Allocation Protocol

basic rate interface (BRI)
configuring lines, 1-11
implementation on router, 4-11
leased line operation, 8-24
leased-line operation, 4-12
overview, 3-2
rate adaption, 4-16
router as a TE1 device, 4-10
signaling support for countries, 4-11
subaddresses, 4-12

Bay Networks Press, xxviii

bearer channel. *See* B channel

BOD Exam Period parameter, A-81

BOD Full Threshold parameter, A-81

BOD Periods to Fail parameter, A-82

BOD Periods to Recover parameter, A-84

BOD Pool ID parameter, A-77, A-79

BOD Recovery Threshold parameter, A-84

Breath of Life (BofL) messages, 2-16

BRI B Channel Loopback parameter, A-23

BRI Line Type parameter, A-24

BRI subaddresses, 4-12

BRI T3 Timer parameter, A-22

BRI T4 Timer parameter, A-23

BRI. *See* basic rate interface

Bridge Enable parameter, A-56

broadcast traffic reduction
dial optimized routing, 5-15, 5-17
IP broadcast timers, 5-18
IP RIP triggered updates, 5-18
IPX RIP and SAP broadcast timers, 5-18
overview, 5-14
static routes, 5-15
traffic filters, 5-19

C

Cable Type parameter, A-6

call setup time, allowing enough for ISDN, 4-20

callback
configuring, 5-9
description, 5-8

Callback Demand Circuit Name parameter, A-101

caller ID service, 4-16

Caller Name parameter, A-52, A-102

caller resolution table
Caller Name parameter, 1-40, 13-1, A-52, A-102
caller names, 1-40, 13-1

CHAP Secret parameter, A-52, A-102
configuring, 1-40, 13-2
customizing, 13-1
description, 4-5
Local Circuit parameter, A-103
Local Group parameter, A-104
overview, 13-1
PAP Password parameter, A-103
Channel Bandwidth Type parameter, A-98
CHAP Local Name parameter, A-37
CHAP names
used by PPP, 4-4
See also caller resolution table
CHAP Secret parameter, A-38, A-52, A-102
circuit backup for dial backup service, 2-14
Circuit Name parameter, A-30
Circuit State Set parameter, A-73
Circuit Type parameter, A-57, A-77
circuits. *See* demand, backup, or bandwidth-on-demand circuits
Compression Control parameter, A-76
Congestion Control parameter, A-69, A-74
Congestion Counter parameter, A-70, A-76
congestion threshold accuracy, 7-8
Congestion Timer parameter, A-69, A-75
Connection Mode parameter, A-28
Connection Type parameter, A-97
customer support
programs, xxix
Technical Solutions Centers, xxix

D

D channel
description, 3-2
function, 3-3
role of LAPD, 3-3
data channel. *See* D channel
data compression
advantages, 5-19, 6-1
backup circuits, 6-1
demand circuits, 5-19
Days parameter, A-45
Debug Mode parameter, A-8
defaults
dial service parameters, C-1
demand circuit groups
configuring, 9-16
configuring caller resolution, 5-12
parameters
Associated IP Address, A-54
Bridge Enable, A-56
IP Enable, A-54
IPX Enable, A-55
IPX Routing Protocol, A-55
IPXWAN Enable, A-56
Number of Circuits, A-51
OSPF Enable, A-55
Pool ID, A-51
RIP Enable, A-55
protocols, 5-13
relationship with demand pools, 5-11
sample application, 6-4
demand circuits
activating, 2-4
adding bandwidth, 2-11
circuit duration, 2-9
configuring, 9-2
configuring availability, 2-10
criteria for activating, 2-4
criteria for deactivating, 2-4, 2-10
customizing, 9-10
data compression, 5-19
deleting, 9-23
enabling a force dial, 2-9
relationship with demand pools, 2-6
scheduling availability, 9-13
demand lines
types of lines used, 2-4
Demand Pool ID parameter, A-4, A-26
demand pools

description, 2-5
IDs for, 2-5
dial backup
circuit backup, description, 2-14
circuits
configuring, 10-17
data compression, 6-1
for failed primary lines, 2-19
Frame Relay, 10-5
Frame Relay filters, 10-12
Frame Relay service records, 10-9
initiating calls, 6-2
terminating, 2-20
default parameter settings, C-1 to C-10
Frame Relay, description, 2-19
implementation notes, 6-1 to 6-6
introduction, 2-1
lines
activating, 2-19
for failed primary circuits, 2-17
location in router slot, 2-17
link backup, description, 2-15
overview, 2-13 to 2-20
parameters
Backup Mode, A-58
Backup Pool ID, A-4, A-57
Cable Type, A-6
CHAP Local Name, A-37
CHAP Secret, A-38
Circuit Type, A-57
Days, A-45
Directory Number, A-87
End Time, A-47
Ext/SubAddr, A-87
Global Adaption Rate, A-19
Incoming Filter, A-18
Interface Type, A-59
Line Media Type, A-5
Max UpTime Termination, A-42
Maximum Up Time, A-42
Modem Command String, A-9
PAP Local ID, A-39
PAP Password, A-40
Pool Channel Count, A-20
Pool Channel Priority, A-21
Pool ID, A-60
Port Application Mode, A-15
port application mode, A-16
Priority, A-6
Sending Complete IE, A-18
SPID, A-88
Start Time, A-46
Switch Type, A-16
UpTime Term. Reset, A-43
Use Backup Interface Filters, A-61
WAN Serial Interface Type, A-4
pools, configuring, 1-5
retrying backup connections, 2-20
dial optimized routing
description, 5-15, 5-17
maintaining routing tables, 5-15, 5-17
Dial Optimized Routing parameter, A-30
dial services
advantages of, 1-1, 2-1
default parameter settings, C-1 to C-10
descriptions, 2-1
types of, 1-1, 2-1
dial-on-demand
circuits. *See* demand circuits
default parameter settings, C-1 to C-10
enabling protocols, 1-23, 9-8
Frame Relay, description, 2-7
implementation notes, 5-1
introduction, 2-1
overview, 2-4
parameters
Auto Demand Term. Reset, A-29
Auto Demand Termination, A-29
Availability Mode, A-49
Cable Type, A-6
CHAP Local Name, A-37
CHAP Secret, A-38
Circuit Name, A-30
Connection Mode, A-28
Days, A-45
Demand Pool ID, A-4, A-26
Dial Optimized Routing, A-30

Directory Number, A-87
Ext/SubAddr, A-87
Force Dial, A-26
Force Take Down, A-26
Global Adaption Rate, A-19
Inactivity Mode, A-44
Inactivity Time, A-27
Inactivity Timeout, A-48
Incoming Filter, A-18
Line Media Type, A-5
Max UpTime Termination, A-42
Maximum Up Time, A-42
Minimum Call Duration, A-43
Modem Command String, A-9
PAP Local ID, A-39
PAP Password, A-40
Pool Channel Count, A-20
Pool Channel Priority, A-21
Port Application Mode, A-15
port application mode, A-16
Priority, A-6
Retry Delay, A-28
Retry Max, A-27
Routing Update Hold Time, A-31
Sending Complete IE, A-18
SPID, A-88
Start Time, A-46
Switch Type, A-16
TimeOfDay Failback Mode, A-49
UpTime Term. Reset, A-43
WAN Serial Interface Type, A-4
pools, configuring, 1-5
DLCI Number parameter, A-72

E

End Time parameter, A-47
Error Threshold parameter, A-67
exchange terminator (ET), description, 3-5
Expert Config parameter, A-12
Ext/SubAddr parameter, A-87

F

filters for Frame Relay, 10-12
floating B option, 4-12
Force Dial parameter, A-26
Force Take Down parameter, A-26
FR Service Control parameter, A-62
Fragmentation Trigger Size parameter, A-85
fragmentation. *See* multilink fragmentation
Frame Relay
dial backup service, 2-15
configuring, 2-19, 10-5
filters, configuring, 10-12
service records, configuring, 10-9
dial-on-demand service
configuring, 2-8, 9-1
description, 2-7
Frame Relay parameters
Address, A-64
Address Length, A-65
Circuit State Set, A-73
Compression Control, A-76
Congestion Control, A-69
Congestion Control (PVC configuration), A-74
Congestion Counter, A-70
Congestion Counter (PVC configuration), A-76
Congestion Timer, A-69
Congestion Timer (PVC configuration), A-75
DLCI Number, A-72
Error Threshold, A-67
FR Service Control, A-62
Full Enquiry Interval, A-66
Hangup on DLCMI Failure, A-70
Hybrid Mode, A-74
Mgmnt Type, A-63
Monitored Events, A-68
Multicast, A-68
Multicast (PVC configuration), A-73
Polling Interval, A-65
Primary Down Time, A-61

Service Name, A-71
Full Enquiry Interval parameter, A-66

G

Global Adaption Rate parameter, A-19
Global X.25 over ISDN-D Channel parameter, A-19
Global X.25 over ISDN-D channel parameter, A-19

H

Hangup on DLCMI Failure parameter, A-70
Hayes signaling for modems, 2-3
Hybrid Mode parameter, A-74

I

implementation notes
all dial services, 4-1 to 4-10
bandwidth-on-demand, 7-1 to 7-8
dial backup, 6-1 to 6-6
dial-on-demand, 5-1
ISDN, 4-10 to 4-20
Inactivity Mode parameter, A-44
Inactivity Time parameter, A-27
Inactivity Timeout parameter, A-48
inbound traffic filtering, 5-19
incoming call filtering, 4-16
incoming call filtering, description, 4-16
Incoming Filter parameter, A-18
Incoming Phone Ext/SubAddr parameter, A-100
incoming phone lists
modifying, 12-11
parameters
Callback Demand Circuit Name, A-101
Incoming Phone Ext/SubAddr, A-100
Incoming Phone Number parameter, A-100
Integrated Services Digital Network (ISDN)
configuring logical lines, 1-17
creating phone lists, 12-1
description, 3-1
functional groups, 3-5
implementation notes, 4-10 to 4-20
leased line operation, 8-24
leased-line operation, 4-12
modifying the ISDN configuration
incoming call filtering, 8-19
switch type, 8-18, 8-19
parameters
Acceptable LAPD MTUs, A-22
BRI B Channel Loopback, A-23
BRI Line Type, A-24
BRI T3 Timer, A-22
BRI T4 Timer, A-23
Ext/SubAddr, A-87
Global Adaption Rate, A-19
Global X.25 over ISDN-D Channel, A-19
Global X.25 over ISDN-D channel, A-19
Incoming Filter, A-18
Pool Channel Count, A-20
Pool Channel Priority, A-21
Port Application Mode (BRI), A-15
Port Application Mode (PRI), A-16
Sending Complete IE, A-18
SPID, A-88
Switch Type, A-16
TEI Type for X.25 over ISDN-D, A-25
TEI Value for X.25 over ISDN-D, A-25
X.25 over ISDN-D Channel, A-24
reference material, 3-8
reference points, 3-6
removing a B channel, 8-28, 8-29
service for dial services, 2-3
standards, 3-2
B channel, 3-2
basic rate interface (BRI), 3-2
primary rate interface (PRI), 3-3
using the ping command, 4-20
Interface Type parameter, A-59
IP Enable parameter, A-54
IPX Enable parameter, A-55

IPX Routing Protocol parameter, A-55
IPXWAN Enable parameter, A-56
ISDN Numbering Plan parameter, A-94
ISDN Numbering Type parameter, A-90, A-91, A-92, A-94

L

LAPD. *See* link access procedure-D
leased-line operation for ISDN BRI, 4-12
Line Media Type parameter, A-5
line pools
  adding, 1-10
  adding BRI lines, 1-11
line terminator (LT), description, 3-5
lines
  adding more to pools, 1-10
  for demand pools, 2-4
  note about leased COM lines, 1-7
  using in the same line pools, 2-26
link access procedure-D (LAPD)
  description, 3-3
  function, 3-3
  LAPD frame contents, 3-4
  Q.921, 3-3
  Q.931, 3-5
link backup for dial backup service, 2-15
Local Circuit parameter, A-103
Local Group parameter, A-104
local phone number, configuring, 1-38

M

Max UpTime Termination parameter, A-42
Maximum Links parameter, A-83
Maximum Up Time parameter, A-42
MCE1
  modifying parameters, 8-14
MCT1
  modifying parameters, 8-14
Mgmnt Type parameter, A-63
MIB Object ID, using, A-2
Minimum Call Duration parameter, A-43
Modem Command String parameter, A-9
Modem Config String parameter, A-12
modem configuration
  AT initialization commands, 4-7
  customizing, 8-6
  parameters
    Debug Mode, A-8
    Expert Config, A-12
    Modem Command String, A-9
    Modem Config String, A-12
    Modem Factory Defaults, A-13
    Modem Init String, A-9
    Modem Type, A-8
    No. of Rings to Answer, A-11
    Originate/Answer, A-13
    Phone Number, A-13
    Redial Count, A-7
    Retry Delay, A-7
    Ring Indicator, A-7
    Set Pulse/Tone Dial Default, A-14
    Speaker Control, A-10
    Speaker Volume, A-10
  selecting modems, 4-7
Modem Factory Defaults parameter, A-13
Modem Init String parameter, A-9
Modem Type parameter, A-8
Monitored Events parameter, A-68
Multicast parameter, A-68, A-73
multilink fragmentation, 7-3
Multilink Fragmentation parameter, A-85
multilink. *See* Point-to-Point Protocol (PPP)
multirate, description, 4-15

N

network terminator (NT1), description, 3-5
network terminator (NT2), description, 3-5

No. of Rings to Answer parameter, A-11

O

one-way authentication, 4-2
Originate/Answer parameter, A-13
OSPF Enable parameter, A-55
outbound traffic filtering, 5-19
outgoing phone lists
  creating, 1-36, 12-3
  modifying, 12-7, 12-11
  parameters
    Adaption Rate, A-95
    Aggregate Bandwidth, A-98
    Channel Bandwidth Type, A-98
    Connection Type, A-97
    ISDN Numbering Plan, A-94
    ISDN Numbering Type, A-90, A-91, A-92, A-94
    Outgoing Phone Prefix, A-99
    Phone Number Type, A-93
    Remote Pool Type, A-96
Outgoing Phone Number Type parameter, A-93
Outgoing Phone Prefix parameter, A-99

P

PAP IDs
  used by PPP, 4-4
  See also caller resolution table
PAP Local ID parameter, A-39
PAP Password parameter, A-40, A-53, A-103
PAP. *See* Password Authentication Protocol, 4-1
parameters. *See* appropriate dial service
Password Authentication Protocol (PAP)
  description, 4-1
  function for dial services, 4-1
  PAP IDs, 4-1
phone lists
  creating incoming phone lists, 12-9
  creating local phone lists, 12-12
  creating outgoing phone lists, 1-36, 12-3
  for Hayes, 12-2
  for ISDN, 1-36, 12-2
  for V.25bis, 12-2
  overview, 12-1
Phone Number parameter (V.34 modem), A-13
Phone Number Type parameter, A-93
phone numbers for the local router, 1-38
ping command for ISDN calls, 4-20
Point-to-Point Protocol (PPP)
  asynchronous PPP, 4-6 to 4-7
  multilink, 2-23, 5-20
    bandwidth-on-demand, 7-2
    fragmentation, 7-3
  requirement for dial services, 4-1 to 4-5
  special line record for dial services, 4-2
  used to identify routers, 4-1
Polling Interval parameter, A-65
Pool Channel Count parameter, A-20
Pool Channel Priority parameter, A-21
Pool ID parameter, A-60
Port Application Mode parameter (BRI), A-15
Port Application Mode parameter (PRI), A-16
PPP Circuit Mode parameter, A-80
PPP. *See* Point-to-Point Protocol (PPP)
Preferred Bandwidth Slot parameter, A-82
PRI. *See* primary rate interface
primary circuits
  activating backups to help, 2-19
  BofL messages for, 2-16
  creating, 10-1
  customizing, 11-2
  detecting failures, 2-16
  for dial backup
    description, 2-13
  Frame Relay, 10-5
  recovering from failure, 2-16
Primary Down Time parameter, A-61
primary lines. *See* primary circuits

primary rate interface (PRI)
implementation on router, 4-13
multirate, 4-15
number of channels, 3-3
overview, 3-3
rate adaption, 4-16
router as a TE1 device, 4-10
signaling support for countries, 4-14
transmission rates, 3-3
using fixed number of channels, 4-14
Priority parameter, A-6
protocol prioritization
for bandwidth-on-demand, 7-7
for dial-on-demand, 5-20
protocols for demand circuits, 1-23
protocols for Frame Relay demand circuits, 9-8
public switched network
types used for dial services, 2-2
public switched telephone network
how router connects, 2-3
publications
ordering, xxviii

Q

Q.921, 3-3
Q.931, 3-5

R

R reference point, description, 3-6
RADIUS accounting, description, 4-8
RADIUS authentication, description, 5-14
Raise DTR signaling
electrical interfaces, 2-3, A-5
rate adaption for ISDN calls, 4-16
Redial Count parameter, A-7
Remote Pool Type parameter, A-96
Reserved Bandwidth Slot parameter, A-83
Retry Delay parameter, A-7, A-28
Retry Max parameter, A-27
Ring Indicator parameter, A-7
RIP Enable parameter, A-55
Routing Information Protocol (RIP)
broadcast timers, 5-18
triggered updates, 5-18
Routing Update Hold Time parameter, A-31

S

S reference point, description, 3-6
S/T interface, 4-10
secondary configuration for Frame Relay backup, 2-19
secondary lines
activating for bandwidth, 2-24
for congested bandwidth-on-demand circuits, 2-23
location in router slot, 2-11, 2-24
Sending Complete IE parameter, A-18
Service Advertising Protocol (SAP) broadcast timers, 5-18
Service Name parameter, A-71
service records, configuring, 10-9
Set Pulse/Tone Dial Default parameter, A-14
shared configuration for Frame Relay backup, 2-19
Speaker Control parameter, A-10
Speaker Volume parameter, A-10
SPID parameter, A-88
standby circuits
balancing traffic, 5-5
configuring, 5-4
description, 5-1
scheduling availability, 5-6
Start Time parameter, A-46
static routes for dial-on-demand, 5-15
switch type modifications, 8-18, 8-19
Switch Type parameter, A-16

synchronous lines
for bandwidth-on-demand, 2-22
for dial backup, 2-13
for dial-on-demand, 2-4

T

T reference point, description, 3-6
Technical Solutions Centers, xxix
TEI Type for X.25 over ISDN-D parameter, A-25
TEI Value for X.25 over ISDN-D parameter, A-25
terminal adapter (TA), description, 3-5
terminal equipment 1 (TE1), description, 3-5
terminal equipment 2 (TE2), description, 3-5
terminating dial backup circuits, 2-20
TimeOfDay Failback Mode parameter, A-49
time-sensitive protocols for dial backup, 6-2
traffic filters, 5-19
two-way authentication, 4-2

U

U reference point description, 3-6
unnumbered IP interfaces for demand circuit groups, 6-2
UpTime Term. Reset parameter, A-43
Use Backup Interface Filters parameter, A-61

V

V.25bis signaling
creating phone lists, 12-1
electrical interfaces, 2-3, A-5

W

WAN Interface Serial Type parameter, A-4

X

X.25 over ISDN-D Channel parameter, A-24
X.25 over the D channel
configuring, 4-19, 8-20
description, 4-18
disabling, 8-21